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TRUCKS AND URBAN CONGESTION

A THESIS

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Otis Marion Trimble

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Approved:

Thesis Advisor

Thesis Reader

Thesis Reader

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SUMMARY

The purpose of this study is to determine the part played by trucks in the overall urban congestion problem, to analyze and evaluate the effectiveness of the measures employed to alleviate this congestion, and to make recommendations for a comprehensive program to alleviate traffic problems resulting from truck operations.

The methods utilized in assembling data for this thesis include a study of the available literature, direct correspondence with applicable national agencies and organizations, and personal interviews with officials of public agencies and truck operators in the Atlanta, Georgia, area.

Different types of truck operations have varying effects on traffic movements. These include trucks moving in traffic streams, loading or unloading at the curb, maneuvering on the street, parked or stored on the street, and operating in terminal areas. Each of these operations is discussed and evaluated from the standpoint of its relative congesting effects. The losses to truck operators and to the general public resulting from traffic congestion are also discussed.

The outstanding characteristic of the measures designed to alleviate congestion resulting from truck operations is their great diversity. These measures include curb loading zones, off-street loading and unloading facilities, improved terminal facilities, consolidated terminals,

terminal districts, truck routes, limitation of truck sizes in central areas, regulation of loading and unloading hours, consolidated pickups and deliveries, scheduled pickups and deliveries, night loading and unloading operations, better utilization of alleys, truck parking lots, and prohibition of angle parking by trucks. Each of these measures is evaluated on the basis of its effectiveness in alleviating traffic problems resulting from truck operations, and its advantages and disadvantages cited. An overall evaluation of all of these measures is also included.

The results of this study revealed that the major deficiencies of most of the present congestion alleviation programs are the lack of a single agency in each city charged with the overall administration of the traffic program and the palliative rather than preventive nature of the majority of the measures utilized. Many cities have designated responsibility for various phases of their traffic programs to a number of different agencies and departments, with the result that there is no coordinated and effective leadership. In addition, most of the present measures alleviate existing congestion, but very few of them are designed to prevent future traffic problems from arising.

Based on the findings of this study, recommendations are made for the establishment of adequate programs of city planning and traffic engineering as the best method of achieving an effective and lasting solution to the truck traffic

congestion problem. The city planning program, through a future land-use plan, major street plan, and effective zoning regulations, should guide the growth of the city in such a manner that future traffic deficiencies are eliminated. The traffic engineering agency should formulate and carry out a comprehensive program for the alleviation of existing traffic problems. A joint attack by the city planning agency and the traffic engineering agency working in close cooperation appears to be the best method for achieving an effective truck congestion alleviation program.

CHAPTER I

INTRODUCTION

Traffic congestion is generally recognized as one of the most critical problems facing modern cities. Urban streets, which constitute only one-tenth of the nation's total road and street mileage, must carry one-half of the nation's total traffic volume.¹ At the present rate of increase, it is estimated that today's approximately 60,000,000 vehicles will increase to from 85,000,000 to 100,000,000 within 25 years.² Cities face a tremendous task not only in alleviating existing congestion, but also in preparing for the far greater traffic volumes yet to come.

Trucks constitute a very important element in urban traffic movements. Trucks numbered 10,128,000 or 16.5 per cent of all vehicles registered in 1955.³ However, studies have shown that they make up a far higher percentage of the total vehicles in city traffic streams. In addition, their size and operating characteristics are such that their traffic congesting effects are much greater than those of other types

¹D. Grant Mickle, "The Changing Picture in Highway Traffic," Civil Engineering, 22 (September, 1952), p. 95.

²Chamber of Commerce of the United States, How to Speed City Traffic, Information Bulletin No. 39, Prepared by the Transportation and Communication Department (Washington, 1954), p. 3.

³Automobile Manufacturers Association, Motor Truck Facts (1955 ed.; Detroit, 1955), p. 20.

of vehicles. Any solution to the overall urban congestion problem will depend to a great extent upon the full recognition and adequate treatment of truck traffic.

Purpose of the study.-- This study attempts to determine the ways in which trucks contribute to city traffic problems. In addition, the measures presently employed or proposed for alleviating the congestion caused by trucks are discussed and evaluated. The results of this research are utilized to prepare general recommendations for a comprehensive program for controlling truck traffic in urban areas. It is hoped that this study will be of benefit not only to cities, but also to truck operators, who suffer heavy losses as a result of traffic delays.

Research methods employed.-- The following research methods were utilized in preparing this study:

1. An extensive search was made of the available literature.
2. Interviews were secured with motor carrier officials, private truck operators, and officials of public agencies in the Atlanta area.
3. Direct correspondence was carried on with national organizations of truck operators and other agencies and organizations.

The available literature.-- There is a considerable body of literature on the problem of traffic congestion caused by trucks. Much of the material treats only one phase of the problem or one

method of alleviation. Other publications are concerned with the overall urban traffic situation and include limited discussions of the effects of trucks on traffic movements. Some of the most comprehensive studies found were those dealing with truck operations in individual cities. No overall treatment of the part played by trucks in the urban congestion problem of the type and scope attempted in this study was found in the literature searched.

CHAPTER II

TRUCKS AND TRUCK OPERATORS

Beginning with their first separate registration of 700 units in 1904,⁴ the number of trucks in operation in this country has increased to over 10,000,000 today. Prior to World War I, they increased in number slowly and were generally limited to local operations. This was due to a lack of adequate rural roads as well as their own mechanical limitations. World War I gave the motor truck its real start. This was a result of their extensive use by the military forces and of the acute railroad congestion which made it necessary for trucks to begin long distance hauling of freight. Truck increased rapidly following the war, and technological improvements such as better lights, air brakes, improved trailers, dual wheels, better engines, and pneumatic tires resulted in greatly improved and more efficient units. The economic depression of the 1930's created conditions favorable to truck operators since their rates were cheaper than railroad rates for less-than-carload shipments. World War II and the Korean war also gave great boosts to truck operations just as had World War I.

The National Defense Transportation Journal estimates

⁴United States Department of Commerce, A Factual Discussion of Motortruck Operation, Regulation, and Taxation, Prepared by the Bureau of Public Roads (Washington: United States Government Printing Office, 1951), p. 4.

that twelve million trucks will be in operation by 1960 which is 16.6 per cent more than the number presently in operation. The same source revealed that both ton-mileage and operating revenues of trucks in 1955 showed a 14 per cent increase over 1954, and 1956 is expected to show an even greater increase over 1955.⁵

There are a number of present trends in the design and operating characteristics of motor trucks that seem likely to continue for some time in the future. These trends include:

1. The percentages of light trucks (less than 9,000 pounds) and heavy trucks (16,000 pounds and over) are increasing, and the percentage of medium weight trucks is decreasing. The percentage of medium weight trucks produced in 1954 was less than one-half the percentage produced in 1946.⁶

2. The percentage of diesel-powered trucks is increasing. Diesel-powered trucks in operation increased 15.1 per cent between 1952 and 1954.⁷

3. The percentage of multi-unit or combination vehicles is increasing, and the percentage of large single-unit vehicles is decreasing.⁸

4. Truck manufacturers are making increased use of

⁵"Twelve Million Trucks by 1960," National Defense Transportation Journal, (March-April, 1956), p. 32.

⁶Automobile Manufacturers Association, op. cit., p. 5.

⁷Ibid., p. 35.

⁸United States Department of Commerce, op. cit., p. 9.

lighter construction materials to keep within weight limits, reduce operating costs, and increase payloads.

5. The use of cab-over-engine type trucks is increasing especially in urban areas due to their shorter length and their greater capacity, visibility, and maneuverability.

6. The number of different types and models of trucks produced is increasing so that there will be a specially designed truck available for almost every type of operation.

7. More compact, efficient, and powerful truck engines are being produced.

To summarize, the overall trend in truck design for the immediate future appears to be toward increasing specialization of models and types, increasing size, and greater operating efficiency and economy.

Advantages of motor truck transportation.-- The motor truck has attained its present position in the transportation field because it offers certain inherent advantages in comparison to its competing forms of transportation. In addition, all competing forms of transportation depend upon trucks at some stage in their transportation process. The major advantages of motor truck transportation are as follows:

1. Small shipments can be handled economically on a door-to-door delivery basis.
2. Service is fast, which is especially important for perishable goods.
3. Less handling is required, which results in less

crating and packing and less damage and loss of freight.

4. Trucks are available in many types and designs to meet the needs of all types of operators.

5. Trucks can go to any location that is served by roads.

Charles A. Taff in his Commercial Motor Transportation summarizes the advantages of motor truck transportation as speed, economy, reliability, and convenience.⁹

Many businesses and industries as well as entire urban communities are completely dependent upon motor trucks for delivery and shipment of all their freight requirements. It does not appear likely that the distribution service provided by the motor truck will be seriously challenged by any other form of transportation in the foreseeable future. Cities and communities should anticipate that they will be living with the motor truck from now on and make their future plans accordingly.

The major groups of truck operators.-- The 10,128,000 trucks in use in this country at the present time are made up of the trucks owned or operated by a number of major groups. Those owned and operated by public agencies at all levels of government are estimated to number 440,000.¹⁰ An estimated 13 per cent of the 9,688,000 privately owned and operated trucks are

⁹Charles A. Taff, Commercial Motor Transportation (Chicago: Richard D. Irwin, Inc., 1950), p. 9.

¹⁰Automobile Manufacturers Association, op. cit., p. 20.

operated on a for-hire basis, and the remaining 87 per cent are operated for strictly private use.¹¹ It is estimated that 35 per cent of all privately owned trucks are farm trucks used directly in the production and marketing of agricultural products.¹² The construction industry uses another estimated 10 per cent of all privately owned trucks.¹³ The remaining 42 per cent are used by other businesses and industries. These include the store delivery trucks, laundry trucks, service trucks, public utility trucks, and the vast number of other special purpose trucks used in private production, distribution, and marketing functions and in semi-public uses. The largest truck fleets in existence are found in this group. An example is the huge fleet of 51,950 trucks operated by the American Telephone and Telegraph Company.¹⁴ As of January, 1955, there were 26,667 fleets of trucks in the country with more than 12 trucks per fleet which made up a

¹¹National Highway Users Conference, The Highway Transportation Story. . . In Facts (2d ed.; Washington, 1954), p. 24.

¹²Jean Lebatut and Wheaton J. Lane (eds.), Highways in Our National Life, A Symposium (Princeton, New Jersey: Princeton University Press, 1950), pp. 252-253.

¹³United States Department of Commerce, Domestic Transportation, An Evaluation of Motor Truck Transportation, Prepared by the Office of Domestic Commerce (Washington: United States Government Printing Office, 1948), p. 25.

¹⁴Automobile Manufacturers Association, op. cit., p. 51.

total of 1,806,000 vehicles or 18.7 per cent of all privately owned and operated trucks.¹⁵ However, more than half of the total number of privately owned trucks are owned by individuals or firms that own only one truck.¹⁶

The trucking industry.-- The trucking industry is made up of the 13 per cent of all privately owned and operated trucks that are operated on a for-hire basis. Long distance trucking, which had its origin during World War I, marked the beginning of the great growth and development of the for-hire motor carrier service or the trucking industry. However, the great majority of for-hire trucks is still used in local rather than long distance service.¹⁷ From its beginning, the trucking industry has been characterized by the small operator. It remains so today in spite of a trend toward consolidation and larger carriers.

The Motor Carrier Act passed by Congress in 1935, also designated as Part II of The Interstate Commerce Act, placed interstate for-hire carriers of passengers and freight under the control of the Interstate Commerce Commission. For purposes of regulation, the Interstate Commerce Commission classifies for-hire carriers as common carriers, contract carriers,

¹⁵Ibid., p. 33.

¹⁶"Where Do Trucks Go From Here?" Business Week (November 22, 1952), p. 70

¹⁷Harold Barger, The Transportation Industries 1889-1946 (New York: National Bureau of Economic Research, Inc. 1951), p. 225.

and exempt carriers. The common carriers are those for-hire carriers that transport general freight on regular schedules and at definite published rates for the public at large. Common carriers operate under a "certificate of public convenience and necessity" issued by the Commission. The contract carriers, who offer a more specialized service than the common carriers, operate under a permit issued by the Commission. They make written or oral agreements with particular shippers and have more flexibility in rates than the common carriers. Some contract carriers operate special equipment for hauling heavy and bulky objects, and others limit their operations to particular types of cargo such as petroleum, automobiles, and refrigerated products. Contract carriers in general are not as closely regulated as common carriers. The exempt carriers, which are made up largely of for-hire carriers that transport agricultural commodities, are subject only to the Interstate Commerce Commission's safety regulations. There are twice as many exempt carriers as there are common and contract carriers combined.¹⁸ For-hire carriers whose revenues amount to \$200,000 or more a year are classified by the Interstate Commerce Commission as Class I Carriers and are more closely regulated than other for-hire carriers. In addition to the Interstate Commerce Commission regulations, each state makes its own regulations concerning

¹⁸"Where Do Trucks Go From Here?" p. 74.

such matters as truck sizes, weights, lengths, and number of axles.

Trucks of the for-hire motor carriers play a much larger part in the urban congestion problem than their number would indicate. These trucks are generally on the move, and they make up a large part of the total truck mileage accumulated, especially in urban areas. Local pickup and delivery trucks operated by the for-hire carriers are generally on the streets throughout the business day. In addition, these carriers operate most of the large combination units, and many of these large trucks are used in local pickup and delivery service as well as in freight interchange between terminals. The average load of a for-hire truck is almost twice that of other privately operated trucks.¹⁹

¹⁹Barger, op. cit., p. 232.

CHAPTER III

TRUCKS AS A FACTOR IN URBAN CONGESTION

Trucks were not a major factor in early automotive traffic congestion due to the fact that until recent times they made up only a small percentage of the total number of motor vehicles. In addition, the early trucks created far less congestion than the horse-drawn vehicles they replaced since their speeds were much closer to the speeds of the passenger vehicle traffic flows. For this reason, the motor truck was looked upon as a congestion alleviating factor in its early days. In 1930, R. H. Whitten, writing in The American City, had the following to say about the motor truck:

While the private passenger automobile increases the burden on the street per passenger as compared with the street car, the motor truck tends to reduce the street burden per ton of goods as compared with the horse-drawn vehicle. This is chiefly due to the greater capacity, speed, reserve power and facility of movement of the motor truck. The substitution of the motor truck for the horse truck and delivery wagon means a very great relief to congestion.²⁰

In spite of the vast superiority of the motor truck over the vehicles it replaced, it soon became an important factor in the urban congestion problem. This can be attributed in part to the constant increase in the number and size of trucks. In addition, the overall congestion problem received more and more attention as time went by because of the increase

²⁰R. H. Whitten, "Unchoking Our Congested Streets," The American City, 23 (October, 1920), p. 352.

in vehicles of all types. The congesting effects of trucks vary directly with the number of trucks in operation as well as with the total number of vehicles of all types in operation. When both trucks and total vehicles increase rapidly, the truck congesting factor is increased at a much greater rate than the simple increase in the number of trucks would imply.

While trucks have long been recognized as an important factor in traffic congestion in some areas, they still do not receive the attention they deserve in much urban traffic planning. No doubt officials are misled by the relatively small percentage of trucks in total vehicle registrations. Traffic studies show that the actual percentages of trucks in urban traffic streams are much higher than the percentage of trucks in total vehicle registrations. Traffic counts in Milwaukee revealed that trucks accounted for 24 per cent of all trips made in the entire Milwaukee area although they made up only 11 per cent of total vehicle registrations.²¹

Congestion caused by trucks in motion.-- An idea of the magnitude of the truck traffic volumes existing today in urban areas is furnished by the statement of William R. McConochie in the Traffic Quarterly that the average city street carries 35 to 45 per cent commercial traffic. Comparing trucks and passenger vehicles, he stated: "Considering the relative operating costs of the two types of vehicles, truck traffic

²¹William R. McConochie, "Trucks, Traffic and Terminals," Traffic Quarterly, 3 (October, 1949), p. 330-331.

now predominates in many cases in the economics of urban traffic problems."²² If the average city street carries 35 to 45 per cent commercial traffic, individual streets range all the way from little or no truck traffic to almost 100 per cent truck traffic in certain industrial and warehouse areas.

A very large percentage of the total truck traffic volume of a city is usually concentrated in the already congested central area of the city. As a result of the heavier overall traffic volumes in the central area as well as the often very narrow streets in that area, the congesting effect of truck traffic in the central area of the city is generally much greater than it would be for the same volume of truck traffic in outlying areas of the city.

As a result of the many factors that must be taken into consideration such as street widths, number of lanes, overall traffic volumes, number of turns, frequency of intersections, and grades, it is difficult to make a definite and exact evaluation of the congesting effect of trucks moving in the regular traffic stream. The size of the commercial vehicles is of great importance in determining their congesting effect. Trucks range in size from the smallest delivery vehicles which take up no more space than the average passenger car up to the largest tractor-trailer units which may require more street

²²Loc. cit.

space than several passenger cars. For this reason, studies of the percentages of commercial traffic in the traffic stream may be misleading as far as the congesting effect is concerned unless the actual vehicle composition of the commercial traffic is known. The width of a truck is much more important than its length from the standpoint of its congesting effect because the wider trucks often in effect take up two lanes. This condition is common where lanes are less than 12 feet in width. A spokesman for the Traffic Division of the Atlanta Police Department pointed out that trucks making turning movements from the center lane have the greatest congesting effect of any type of truck movements in traffic streams.

Due to their heavy loads, trucks in general have far more difficulty maintaining speed on grades than do passenger cars, and their congesting effect is greatly multiplied on roads with steep grades. Grades of over five per cent are undesirable for commercial traffic.²³ One study has shown that on a multilane expressway in level terrain, one medium size commercial vehicle (limited to trucks having dual wheels on the rear axle) has approximately the same congesting effect as two passenger cars; and in rolling terrain, the same vehicle has approximately the congesting effect of four passenger cars. On two-lane roadways, the congesting effect of the commercial

²³Cincinnati City Planning Commission, Trucking, Metropolitan Master Plan Study (1951), p. 29.

vehicle is 25 per cent greater.²⁴ In terrain classified as mountainous, one medium truck averages the same congesting effect as eight passenger cars. The exact congesting effect varies with the actual grade, curvature of the road, and sight distance.

The congesting effect of truck traffic is greatly increased if intersections are numerous because acceleration and deceleration rates for trucks are generally lower than for passenger cars and buses.²⁵ The effect of the average commercial vehicle crossing an intersection is equivalent to two passenger cars as far as intersection capacity is concerned and is even greater if a turning movement is involved.²⁶ The sight of a large combination unit completely blocking an intersection with a turning movement is not unusual. Intersections are probably the focus of the greatest congestion caused by trucks in the traffic stream.

The greatest congesting effect of trucks moving in the

²⁴United States Department of Commerce, Highway Capacity Manual, Prepared by the Bureau of Public Roads (Washington: United States Government Printing Office, 1950), pp. 56-57.

²⁵Bruce D. Greenshields, Donald Schapiro, and Elroy L. Erickson, Traffic Performance at Urban Street Intersections, Technical Report No. 1 (New Haven, Connecticut: Yale Bureau of Highway Traffic, Yale University, 1947), p. 21, 36.

²⁶United States Department of Commerce, Highway Capacity Manual, p. 81.

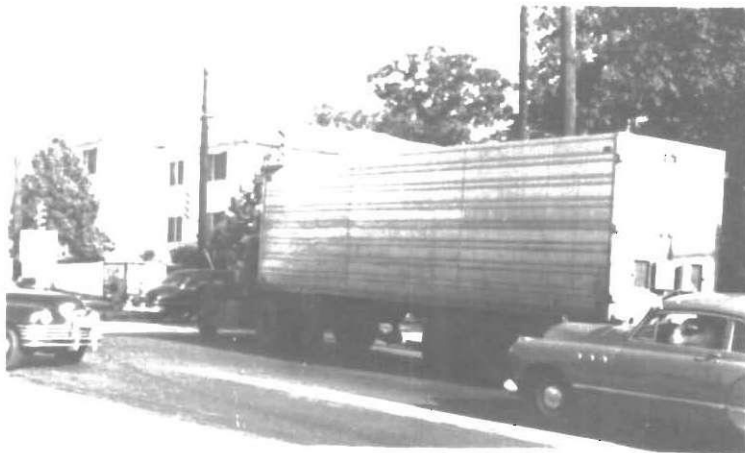


Figure 1. Trucks in City Traffic Movements

traffic stream is felt during the peak traffic hours, particularly during the evening rush-hour period. Unfortunately, most shippers want their freight picked up at the end of the working day with the result that a very large number of pickup vehicles must be in the traffic stream during the evening rush-hour period. The morning truck operations are mainly deliveries, which are generally spread over a several hour period. As a result, trucks are not concentrated on the streets in the morning rush-hour period traffic stream to the extent that they are during the evening rush-hour period.

Some types of truck traffic tend to use rather definite routes within the city. Studies in Chicago revealed that the large over-the-road units follow fairly closely certain routes through the city to the various terminals.²⁷ Unfortunately from a congestion standpoint, the routes followed by this heavy vehicle traffic are often multiple purpose streets which are not designed for heavy trucks. Local delivery vehicles use any street convenient to them. It was found in Chicago that more than one-half of the local delivery vehicles operated by the intercity common carriers are the same large tractor-semi-trailer units used in the over-the-road service. The use of these large units on the crowded central area streets adds greatly to the overall congestion in this area.²⁸ This sit-

²⁷Jerome D. Fellmann, "Emergent Urban Problems of Intercity Motor Transportation," Land Economics, 27 (May, 1951), pp. 95-96.

²⁸Ibid., p. 98.

uation is not unique to Chicago, but is common in cities throughout the country.

Congestion caused by trucks loading and unloading on the street.-- Trucks loading and unloading on the street range from the small delivery truck parked parallel to the curb that takes up no more street space than a parked passenger car to the tractor-trailer unit backed up crossways of the street to a loading ramp which virtually cuts off all traffic movement on the street. The extent of the problem in a particular situation depends upon many factors including the width of the street, the through traffic volume, the number of trucks involved, the sizes of trucks involved, the existence of definite curb loading zones, the amount of curb parking, and the types of business involved. The congesting effects of street loading and unloading operations are greatest during the morning and evening rush hours.

Some of the worst congestion conditions resulting from loading and unloading operations existing anywhere are found in the garment area of New York City. The streets in this area are narrow, and both sides of the streets are generally lined solidly with trucks being loaded and unloaded. These two lines of trucks take up such a large portion of the total street width that there is very little room left for any traffic movement between them. Space at the curb is at such a premium that in the morning, long before working hours, employees are sitting on the curb in front of the loft buildings with their feet in

the street to hold the precious curb space for a particular truck.²⁹ While this is an extreme example, conditions approaching it may be found in central areas of cities throughout the country.

One of the most serious types of congestion resulting from loading and unloading operations is that caused by trucks that must double park in order to load or unload. This means that two full lanes of the street are closed to normal traffic flow. This condition results when all the space at the curb is taken up by parked trucks or automobiles. It is most characteristic of crowded central areas where no adequate alleys or off-street loading and unloading facilities exist and where the businesses are small and of the type that require frequent delivery service.

Other types of loading and unloading operations resulting in very serious congestion conditions are those operations that require the truck to back up to a loading dock at the edge of the street or sidewalk so that the truck extends crossways of the street and completely blocks the sidewalk. Where the delivery vehicles are large, such as the over-the-road tractor-trailer units, the entire street may be very effectively blocked as far as traffic movement is concerned. While this type of

²⁹American Trucking Associations, Inc., The Case for the Trucking Industry, Testimony at Subcommittee Hearings on Senate Resolution 50, June-July, 1950 (Washington, 1950), p. 5.

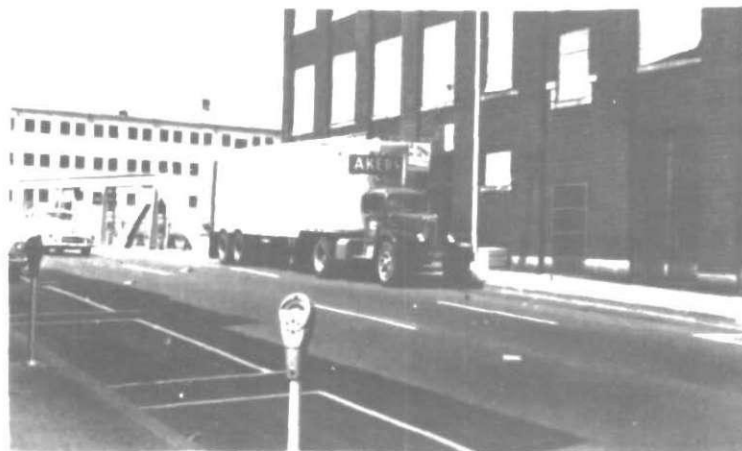
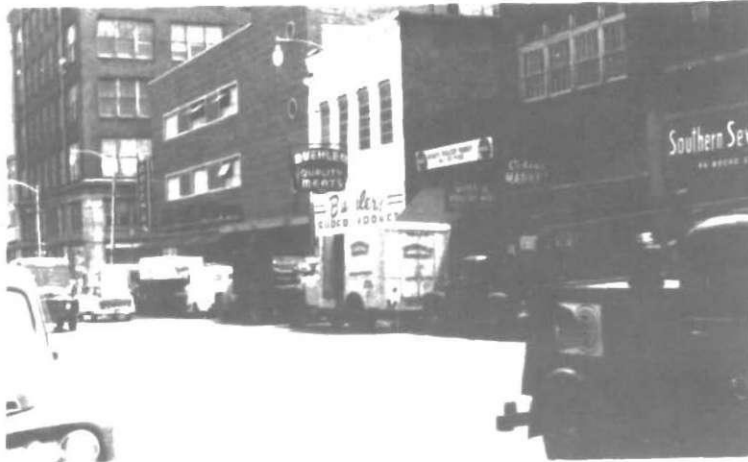


Figure 2. Trucks Loading and Unloading on the Street

operation is generally found on the less important and less traveled streets, it occurs on more important streets frequently enough to be a serious hindrance to normal traffic flows.

Even one truck parked at the curb to load or unload blocks one entire traffic lane. This is particularly important during rush hour periods when all lanes are needed for moving traffic. In addition to interfering with vehicular traffic movement, curb loading and unloading operations also interfere with pedestrians on the sidewalk who have to dodge stacks of freight or freight being moved along the sidewalk.

There are a number of other factors in loading and unloading operations on the street which add to the overall congesting effect. One of the most important is the large number of trucks belonging to different carriers that call at the same establishment for pickups and deliveries. This practice is not only a great cause of congestion, but it is also expensive to the carriers since the trucks are usually virtually empty. In addition, the excessive number of trucks puts a strain on the shipping and receiving departments of the establishments concerned. Another practice that adds to the overall congestion is the needless delay of trucks by shippers either by failing to have shipments ready on time or through inefficient shipping or receiving facilities. An example is the absence of adequate freight elevators so that the freight cannot be loaded or unloaded from the trucks as fast as it should be. Some delay and resulting congestion must be credited to drivers who waste

time at the curb or do not use alley or off-street loading and unloading facilities even when such facilities are available. Other important factors in loading and unloading congestion are the failure to provide adequate curb loading space and the taking of all the curb space for automobile parking. All of these factors combined make curb loading and unloading one of the most critical aspects of the entire trucking congestion problem.

Congestion caused by trucks maneuvering in the street.--

Another important aspect of truck traffic congestion is the congestion resulting from the maneuvering or manipulating of trucks in the street. This usually takes place when a truck must pull into a narrow curb space, back into an off-street loading dock, enter a narrow alley, or back to the curb at an angle for loading and unloading. In some narrow streets, this type of congestion often represents the most critical aspect of the truck traffic problem. It often takes place in conjunction with other aspects of the problem such as trucks parked for curb loading and unloading so that the overall congesting effects are magnified. One of the most important factors in this type of congestion is the size of the trucks involved. A huge over-the-road tractor-trailer unit maneuvering into position for loading or unloading can effectively block even a fairly wide street for a considerable period of time. Any truck requires much more area for maneuvering than it does standing parked. In many cases where off-street facilities for loading and unloading ex-

ist, no manipulation area is provided, and all the necessary maneuvering operations must be done entirely on the street. Studies have shown that manipulation or maneuvering delays are greatest when the vehicles involved are long, when the maneuvering area is limited in size, and when the loading space is congested.³⁰

Congestion caused by trucks parked and stored on the street.--

Congestion resulting from trucks parked or stored on the street appears to be a serious problem in some cities and a comparatively minor problem in others. Its seriousness seems to depend upon certain conditions in the city itself such as the amount of off-street truck parking facilities available, which in turn depends to a great degree upon the extent to which the area is built-up. The problem is usually not particularly serious in areas sparsely built-up with considerable vacant land available for parking and storage of trucks. The problem becomes increasingly serious in the closely built-up central areas, particularly in the larger cities. Studies in Chicago have shown that parking and storage of trucks on the street, especially near terminal areas, is a very serious problem.³¹

³⁰National Research Council, Highway Research Board, Zoning for Truck Loading Facilities, Bulletin No. 59 (Washington, 1952), p. 43.

³¹Phil Hirsch, "Chicago Fleetmen Battle Traffic Bottle-necks," Commercial Car Journal, 87 (June, 1954), p. 71.

Probably the major culprits are drivers for out-of-town carriers who maintain no terminal facilities in the city. Since they are not familiar with the city, particularly in the case of the larger cities, the temptation is great to leave their vehicles parked on the street rather than go to the trouble to find an off-street parking place. Many drivers leave their vehicles parked on the street in front of a business establishment or factory following loading or unloading operations and go in search of food, sleep, or recreation. This is particularly serious in the already congested central areas which are often characterized by narrow streets. A truck parked at the curb takes up the same street space as a truck loading or unloading at the curb, and the time element is also much greater in the case of the parked truck. Not only is traffic flow impeded, but other trucks are prevented from using the space for loading and unloading. In addition, the parked vehicles are very likely to be large over-the-road tractor-trailer units which occupy a large street area. The use of streets in congested areas for parking and storage of trucks cannot be justified on any grounds.

Congestion caused by truck operations in terminal areas.--

Probably the greatest truck traffic congestion problems to be found in most larger cities are those existing in the areas where truck terminals are located. Many terminals are located in the closely built-up and congested areas near the heart of the city. Since the central areas of cities were generally the

important areas of commercial, industrial, and transportational facilities, many motor carriers in the past located their terminals as close as possible to these already congested areas. In some cases, the terminals are relatively scattered, and in others they are more or less grouped in fairly well defined clusters. The close-in terminals are generally characterized by obsolete and inefficient facilities and lack of adequate space for loading, unloading, and storage of trucks. Most of them are old buildings that have been converted from other uses into terminals.

There has been a trend in recent years for many of the terminals to follow other industrial and commercial establishments by moving to outlying areas where more space is available for the construction of modern facilities. There is likely to be some truck traffic congestion even in the vicinity of these modern outlying terminals, but it is on nothing like the scale existing in the close-in terminal areas.

Adding to the seriousness of the congestion problem are the land-use and street patterns usually existing in the areas adjacent to the central area of the city. These areas are generally served by narrow streets, characterized by small chopped-up land parcels, and usually already congested by trucking operations serving the business and industrial establishments existing in the area. Locating truck terminals in such areas through a desire to be close to the industrial and commercial heart of the city results in a vast increase in

the truck congestion in the area. The large over-the-road combination units must be funneled over the narrow and already congested streets to reach their respective terminals.

Adding their share to the overall congestion in these terminal areas are the large number of local pickup and delivery trucks operated by the carriers. They are generally more numerous than the large over-the-road trucks, and in addition, each truck makes frequent trips in and out of the terminal throughout the day. In addition to the over-the-road and local delivery trucks operating out of the terminal, there is usually a considerable amount of interline freight transfers between terminals so that additional trucks are on the street. These interline truck units are often of the large over-the-road type.

The terminal operations themselves often add considerably to the congestion situation. Due to lack of space, there is a tendency for waiting trucks to be parked or stored on the street. Insufficient parking areas at the docks means that the larger trucks are likely to take up considerable space on the sidewalk and street. While backing up to the docks, the continuous maneuvering and manipulating, particularly of the larger trucks in the limited areas, takes up a large part of the street area. The entire situation is aggravated by the fact that loading and unloading operations in these obsolete and makeshift terminals are very inefficient and time consuming.

Increased truck operation costs resulting from traffic con-

gestion.-- Numerous studies have been made of the increased truck operation costs resulting from traffic congestion. These increased costs reduce the overall inherent economies of trucks and result in failure to realize the full advantages that trucks should offer as an efficient and economical method of transport. These increased costs of operation brought about by congestion are passed on by the truck operators to the consumer. The effect of congestion on truck operations is costly to all concerned, and alleviation of this congestion benefits the truck operators, all other vehicle operators, shippers, and consumers. The truckers themselves have every reason to support measures that reduce traffic congestion because it enables them to operate more economically and efficiently and to make a greater margin of profit. In addition, they are able to offer a lower rate to shippers, which in turn increases business. These benefits are in addition to the primary community benefits of alleviating the strangling effects of traffic congestion on cities.

As early as 1920, R. H. Whitten had the following to say about the results of traffic congestion on truck operation costs:

Extreme congestion means not only that street car service is disrupted, but that all trucking and commercial traffic is slowed down. The cost of trucking is a much larger factor in the cost of most goods than is railroad freight. Many products are transferred by vehicle through city streets a half-dozen or more times before they reach the consumer. If, through street congestion, as is undoubtedly true in parts of Chicago, New York and London, the time and cost of trucking goods is doubled, the toll due to congestion is certainly enormous. It is paid in part by the public in higher prices. It also places a serious handicap on city com-

merce and industry.³²

The increased truck operation costs resulting from congestion for the nation as a whole are estimated to total \$1,000,000,000 a year.³³ A study made by the New York Trucking Association in 1950 disclosed that the average truck in New York City was losing four hours a day because of traffic congestion. Using seven cents as the cost per minute of truck time, it was found that a daily loss of \$16.80 per truck was caused by congestion. On this basis, the annual cost of congestion to the 30,000 trucks serving the New York area was placed at \$150,000,000.³⁴ Transportation delays in New York City are said to increase the price of milk alone by \$1,000,000 a year.³⁵ A study in Providence, Rhode Island, estimated delay costs in 1948 at from \$3.00 an hour for light trucks to \$4.50 an hour for tractor-semitrailer units plus an additional \$1.50 an hour for each helper. On this basis, the loss to truck operators was estimated at \$55,000 a day and \$15,000,000 a year.³⁶ There seems to be fairly general agreement that truck

³²Whitten, op. cit., p. 354.

³³J. W. Gibbons, "The Economic Costs of Traffic Congestion," The University of Tennessee Record, 57 (July, 1954), p. 13.

³⁴"The High Cost of Congestion," Engineering News-Record, 145 (October 19, 1950), p. 23.

³⁵Henry K. Evans, "Six Bargain Steps to Smoother Traffic," Nation's Business, 42 (July, 1954), p. 26.

³⁶"Providence's Million-Dollar Headache," The American City, 43 (March, 1948), p. 137.

operation costs range from five cents per minute for light trucks to fifteen cents per minute for tractor-semitrailer units. These estimates are based upon major items such as increased labor costs, fuel and oil costs, and wear and tear on tires and other equipment in addition to numerous less obvious costs such as depreciation, insurance, and interest on the investment.

James C. Buckley, writing in the Journal of the American Institute of Planners, pointed out that while long-haul freight transport by trucks has made tremendous strides in overall efficiency throughout the history of motor trucks, local handling of freight is the big "bottleneck" in the entire motor freight picture.³⁷ On the whole, local freight handling methods have remained virtually the same during the period of great advances in long-haul trucking. The result is increased costs due to the continuance of the antiquated local freight handling methods, which not only suffer more and more from overall urban congestion, but also add greatly to congestion. The increasing costs and inefficiencies of local motor freight handling have largely negated the economies and advances made in long-haul motor freight movement. When it is considered that the trucking industry's rise was due to its inherent characteristics of econo-

³⁷ James C. Buckley, "Comprehensive Transportation and Terminal Planning for Large Urban Centers," Journal of the American Institute of Planners, 13 (Winter, 1947), pp. 11-12.

my, speed, flexibility of service, and efficient door-to-door delivery service, the great seriousness of the present situation to the trucking industry can be appreciated.

In spite of the growth of truck operation deficiencies, the fact remains that there is still no other form of transportation that can supplant trucks in the local delivery field. The only logical course for both truck operators and the cities themselves is to work for alleviation of the overall congestion problem in urban areas including that portion of the problem resulting directly from truck operations.

CHAPTER IV

MEASURES PRESENTLY UTILIZED FOR ALLEVIATION OF THE CONGESTION RESULTING FROM MOTOR TRUCK OPERATIONS

Numerous measures have been utilized or proposed to alleviate congestion resulting from truck operations. One of the outstanding characteristics of these measures is their great diversity. Examples of the important ways in which they differ are as follows:

1. Some alleviate existing congestion, and others prevent additional congestion from arising.

2. Some are instituted through public action, and others through private action.

3. Some have congestion alleviation as their primary purpose, and others achieve it indirectly as a by-product of their primary purpose.

4. Some are simple and easily instituted and administered, and others are complex and require elaborate administrative systems.

5. Some produce effective results immediately on being employed, and others require long periods of time before they show any appreciable results.

6. Some cost very little to employ, and others require large expenditures.

7. Some alleviate congestion in a limited area only, and the effects of others may be felt over an entire metropolitan area.

8. Some apply to only one type of trucking congestion, and others apply to several types.

9. Some may be employed by any community, and others are applicable to only the larger cities.

Urban areas vary widely both in the extent of their truck congestion problems and in the alleviation measures utilized. The number and types of alleviation measures employed in a particular urban area depend upon many factors including among others its size, land-use pattern, street pattern, topography, major economic activities, and location with respect to major transportation routes.

The remainder of this chapter consists of discussions of the important truck congestion alleviation measures presently employed or proposed in urban areas throughout the country. Curb loading zones.-- The best known and most widely used measure for alleviation of congestion resulting from truck operations is the curb loading zone, revealed by one study to be used in two out of every three cities.³⁸ The purpose of the curb loading zone is to keep certain areas along the curb free of parked vehicles so that trucks can pull to the curb and load or unload with a minimum of delay and congestion. Where adequate curb loading zones are not available, trucks desiring to load or unload at the curb often cause serious congestion by double parking, circling the block, or some other delaying action.

³⁸Evans, op. cit., p. 70.

Procedures for providing and administering curb loading zones vary widely among cities. Some cities set aside a specified area, often at a definite location in each block, for use as a curb loading zone. Other cities designate curb loading zones only upon application of the owner or operator desiring a loading zone in front of his establishment. Some of the cities utilizing the latter method require that the cost of the necessary signs and markings be met by the business requesting the zone. According to Karl A. Bevins, head of the Atlanta Traffic Engineering Department, the practice in Atlanta is for the owner or operator of an establishment desiring a curb loading zone to submit a letter of request, which generally includes statements of neighboring establishments that they do not object to the proposed zone. The Atlanta Traffic Engineering Department then surveys the existing situation and establishes the zone if it is found to be justified. Provisions of the Model Traffic Ordinance in regard to establishment of curb loading zones are included under Article XV as follows:

Sec. 137. City traffic engineer to designate curb loading zones. - The city traffic engineer is hereby authorized to determine the location of passenger and freight curb loading zones and shall place and maintain appropriate signs indicating the same and stating the hours during which the provisions of this section are applicable.

Sec. 138. Permits for curb loading zones. - The city traffic engineer shall not hereafter designate or sign any curb loading zone upon special request of any person unless such person makes application for a permit for such zone and for two signs to indicate the ends of each such zone. The city traffic engineer upon granting a permit and issuing such signs shall

collect from the applicant and deposit in the city treasury a service fee of (\$) per year or fraction thereof and may by general regulations impose conditions upon the use of such signs and for reimbursement of the city for the value thereof in the event of misuse or upon expiration of permit. Every such permit shall expire at the end of 1 year.³⁹

Curb loading zones vary widely among cities in regard to such aspects as size, number per block, and time limits for use. A study of 506 cities of over 16,000 population revealed that:

1. Curb loading zones in these cities ranged from 30 to 48 feet in length.
2. One-third of the cities limited the number of curb loading zones per block, with the great majority allowing only one zone per block.
3. Definite time limits for trucks loading and unloading in curb loading zones were set in 208 cities with 30 minutes the most frequently used time limit.⁴⁰

Article XV of the Model Traffic Ordinance contains the following provisions regarding the use of curb loading zones:

Sec. 140. Standing in freight curb loading zone. - (a) No person shall stop, stand, or park

³⁹United States Department of Commerce, Model Traffic Ordinance, Prepared by the National Committee on Uniform Traffic Laws and Ordinances (Washington: United States Government Printing Office, 1953), p. 28.

⁴⁰Henry K. Evens (ed.), Traffic Engineering Handbook (2d. ed.; New Haven, Connecticut: Institute of Traffic Engineers, 1950), p. 307.

a vehicle for any purpose or length of time other than for the expeditious unloading and delivery or pickup and loading of materials in any place marked as a freight curb loading zone during hours when the provisions applicable to such zones are in effect. In no case shall the stop for loading and unloading of materials exceed 30 minutes.⁴¹

In conjunction with this section, it is well to note that curb loading zones are generally in effect only during specified hours and that at other times the space may be used for moving or parked vehicles.

The advantages of curb loading zones include the following:

1. They usually eliminate the very serious congestion problem created by trucks double parking or circling the block.
2. They are simple and inexpensive to establish which means that they can be used in communities of any size.
3. Enforcement is fairly easy since it can be taken care of by the policeman on his regular patrol.
4. The alleviation effects are apparent immediately upon employment.

Inherent disadvantages of curb loading zones are as follows:

1. They take up space that often is needed for moving traffic since even one truck standing at the curb effectively blocks the curb lane for traffic movement.
2. Curb loading zones in some areas take up space that

⁴¹United States Department of Commerce, Model Traffic Ordinance, p. 28.

might otherwise be utilized for customer parking.

3. Curb loading and unloading activities are often very inefficient and uneconomical since goods must be stored and moved along the sidewalk and through the front entrances of establishments with an increased likelihood of damage and pilferage.

4. Moving and stacking of freight on the sidewalk interferes with pedestrian movements and causes ill feeling toward the establishment involved.

Other disadvantages of curb loading zones which result from inadequate planning, administration, and enforcement are as follows:

1. They are often poorly located so that trucks refuse to utilize them and continue to double park in front of their destinations.

2. They are often poorly marked and enforced so that they are used for automobile parking.

3. Merchants often take advantage of the loading zones in front of their establishments for parking and storage of their own private or commercial vehicles between trips.

4. They are sometimes provided where loading and unloading could be adequately carried on in an alley or off-street.

5. They are often inadequate for the size or number of trucks utilizing them.

The disadvantages of curb loading zones appear to the

writer to outweigh its advantages in most cases. However, it is recognized that in some densely built-up central areas, curb loading will continue to be the only way in which loading and unloading operations can be carried on for the foreseeable future. In other areas, the constantly increasing demand for additional space for moving traffic will require a reduction in areas set aside for curb loading zones. Much can be done in individual cities to correct many of present disadvantages of curb loading zones through study of the entire problem and through improved administration and enforcement. Some cities are making important strides in this direction. An example is Minneapolis, which has enacted regulations requiring all vehicles parking in a curb loading zone to have a commercial vehicle license as well as the name of the owner and operator clearly printed on the body of the vehicle.⁴² The enactment and strict enforcement of the provisions of the Model Traffic Ordinance applying to curb loading zones are recommended in conjunction with a complete study of the overall curb loading zone problem in order to insure that curb loading zones will be provided only where no other type of loading and unloading facility can be utilized.

Off-street loading and unloading facilities.-- The provision of off-street loading and unloading facilities is receiving in-

⁴²"Large Cities Permit Curb Loading," Public Management, 31 (April, 1949), pp. 119-120.

creasing attention as an alleviation measure for congestion resulting from truck operations. Under this measure, the necessary loading and unloading facilities for any establishment or land use are provided on the premises thereby taking loading and unloading operations off the street. Requirements for off-street loading and unloading facilities are usually included as a part of the zoning ordinance and enforced by the building inspector. The provisions generally apply only to new construction or to major alterations of old structures. Since the provisions must be fitted to many types of land uses and businesses, they are fairly complex and often require elaborate specifications, particularly in the larger cities.

The first off-street loading and unloading facilities were provided voluntarily by certain businesses that recognized the advantages of carrying on their loading and unloading operations on their own property and keeping pickup and delivery vehicles away from the curb in front of their establishments. Provision of these facilities is regarded as a legitimate cost of doing business in addition to increasing the value of the property through its increased accessibility. An increasing number of modern commercial and industrial establishments voluntarily provide off-street loading and unloading facilities.

Memphis, Tennessee, was one of the first cities to require off-street loading and unloading facilities. It added such a provision to its zoning ordinance on October 18, 1927.⁴³

⁴³National Research Council, op. cit., p. 3.

A total of at least 107 local governmental units were found to require off-street facilities as of July 1, 1951, in a study made by the Highway Research Board.⁴⁴ It was found that the percentage of cities having such requirements increases directly with population. This is demonstrated by the fact that only six per cent of cities in the 10,000 to 25,000 population group have off-street requirements while 22 per cent of the cities of 100,000 population and over have enacted such requirements.⁴⁵

Studies by the Highway Research Board of the provisions of 66 off-street loading and unloading ordinances revealed that they vary widely in their application to various areas of the city as well as to various land-uses. One-third of the ordinances did not apply to the central business district.⁴⁶ Forty-one (62 per cent) applied to industrial and manufacturing uses. Fifty-four (82 per cent) applied to general business and commercial establishments. Only 14 (21 per cent) included hotels, hospitals, and institutional buildings. Eleven (17 per cent) applied to retail and wholesale stores, warehouses, loft buildings, and laundries.⁴⁷ It was found that cities in the

⁴⁴Ibid., p. 47

⁴⁵Edward Mogren and Wilbur Smith, Zoning and Traffic (Saugatuck, Connecticut: The Eno Foundation for Highway Traffic Control, 1952), pp. 93-94

⁴⁶National Research Council, op. cit., pp. vii-viii.

⁴⁷Ibid., pp. 11-22.

small population groups more frequently require such facilities in all types of buildings than do large cities.⁴⁸

Most existing off-street provisions use gross floor area alone or in conjunction with the type of land-use as the basis for determining the extent of the off-street loading and unloading facilities required. Some of the latest zoning ordinances, including the amended Chicago ordinance, require loading and unloading berths according to a sliding scale of gross floor areas.⁴⁹ It has been found that for any land-use, berths are not required in direct proportion to the amount of gross floor area. After the first berth, each additional berth can serve a progressively larger area.⁵⁰

The size of the off-street loading and unloading space required varies widely in the different ordinances. The off-street provisions of the Chicago Zoning Ordinance as amended July 28, 1954, contain the following definition and requirements:

Off-street Loading and Unloading Space -- An open, hard-surfaced area of land other than a street or public way, the principal use of which is for standing, loading and unloading of motor trucks, tractors, and trailers, to avoid undue interference with the public use of streets and alleys. Such space shall not be less than 10 feet in width, 45 feet in length and 14

⁴⁸Mogren, op. cit., p. 95.

⁴⁹City of Chicago, Off-Street Parking and Loading Provisions of the Chicago Zoning Ordinance As Amended to July 28, 1954, Prepared by the City Council Committee on Buildings and Zoning (1954), pp. 14-18.

⁵⁰American Automobile Association, Parking Manual, Prepared by the Traffic Engineering and Safety Department (Washington, 1946), p. 85.

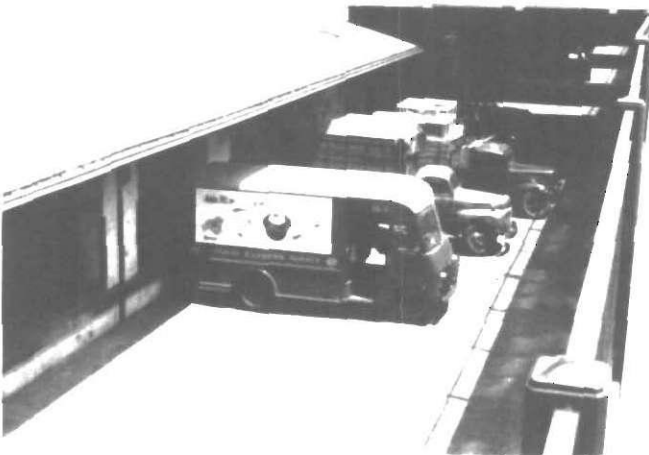
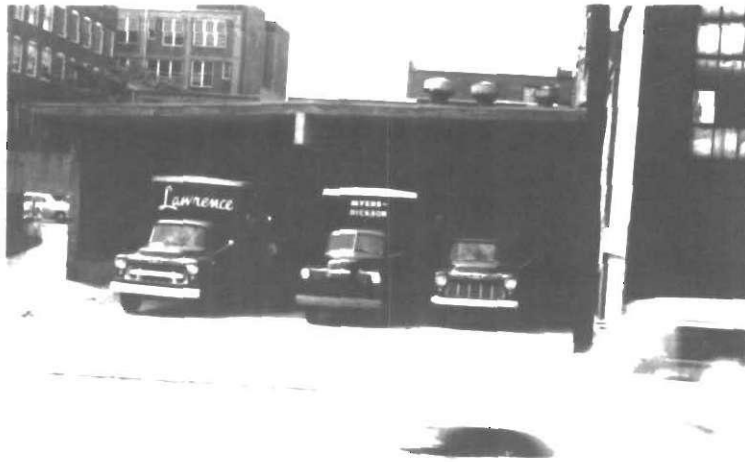


Figure 3. Off-Street Loading and Unloading Facilities

feet in height, exclusive of access aisles and maneuvering space, except as provided in Section 4.2.⁵¹

The Atlanta Zoning Ordinance requires a loading space at least 35 feet long, 12 feet wide, and 14 feet high. The Institute of Traffic Engineers has suggested specifications requiring truck berths to be 40 to 50 feet in depth behind the property line, 12 to 14 feet wide, and to have 12.5 to 14 feet of overhead clearance with freight platforms 12 to 15 feet in depth and 40 to 50 inches in height.⁵²

Joint or cooperative off-street loading and unloading facilities have been recommended in areas that are densely built-up with many small establishments. In this way many establishments that can not provide individual facilities due to space and other limitations or that do not require frequent service can be served on a joint basis by conveniently located facilities. In some cases one facility might serve an entire business block with a great saving in unnecessary duplication of facilities. Since joint facilities would have fewer entrances and exits than a larger number of individual facilities, there would be less interference with moving traffic. As discussed above, larger facilities are more efficient on a unit area basis and total space requirements are less. While the con-

⁵¹City of Chicago, op. cit., p. 1.

⁵²City of Charlotte, North Carolina, Improvement Plan for Trucking Operations, Prepared by the Traffic Engineering Department (1951), p. 15.

ventional off-street facilities are required to be provided within or adjacent to the property they are to serve, a more liberal distance is necessary in the case of joint or cooperative facilities. However, both types of facilities should be located as far from street intersections as possible. The Chicago Zoning Ordinance forbids the location of loading or unloading facilities less than 25 feet from an intersection.⁵³

The advantages of off-street loading and unloading facilities are widely recognized. Every trucking official interviewed by the writer expressed himself as being in favor of such facilities. The major advantages of off-street facilities include:

1. Vehicles loading and unloading are taken completely off the street, which leaves street space for moving traffic or for parking.

2. There are no costs to the city except the costs of enforcing the off-street loading and unloading provisions as a part of the zoning ordinance. The businesses actually benefiting from such facilities bear the cost of providing them.

3. They provide far more efficient and faster loading and unloading operations than curb loading and unloading.

4. The congestion alleviating results are of a more permanent nature than those of most of the other measures.

There are several inherent disadvantages as well as a considerable number of shortcomings to many of the off-street

⁵³City of Chicago, op. cit., p. 18.

ordinances now in effect. The inherent disadvantages include the following:

1. The congestion alleviation effects of off-street facilities are felt only gradually as new structures are built or old ones given major alterations, with the result that the full benefits are generally realized only after a considerable number of years have passed.

2. The off-street provisions do not apply to already existing structures unless they have extensive alterations, with the result that the effects are felt more in the newer areas of the city and very little in the older built-up areas where the greatest congestion generally exists.

Some of the major shortcomings of the present off-street provisions are as follows:

1. There is generally a very inadequate or no requirement for maneuvering space in conjunction with the off-street facilities so that trucks maneuvering into off-street facilities must do so largely in the street. The Atlanta Zoning Ordinance requires that a maneuvering space of 49 feet "from the front of the loading space to the curb side of the most remote traffic lane in the access street" must be provided only if the street is designated as a major thoroughfare.⁵⁴

2. Many of the provisions require berths much too small for the larger trucks with the result that trucks extend out over the sidewalk and street area. The Atlanta Zoning Ordinance

⁵⁴City of Atlanta, Zoning Ordinance (1954), p. 23.

provisions require a berth 35 feet in length.⁵⁵ However, Georgia law allows trucks to be 48 feet in length.

3. Only two-thirds of the present ordinances apply to the central business district which is generally the area of greatest congestion. Atlanta's off-street provisions do include the central business district.⁵⁶

4. Very few of the present ordinances cover all land-uses that require truck loading and unloading activities.

5. Many present ordinances base their requirements on gross floor area regardless of the type of use. This is completely unrealistic because some establishments are required to provide facilities beyond their actual needs, and others are not required to provide sufficient facilities for their needs.

The inherent advantages of off-street loading and unloading facilities far outweigh its disadvantages. It is one of the most promising long-term congestion alleviation measures. There is a great need to eliminate the shortcomings of many ordinances which keep their maximum congestion alleviation results from being realized. Overall recommendations to improve off-street ordinances include:

1. Every ordinance should be based upon a study of the city's overall loading and unloading needs. Factors to be considered in such a study should include the size and type of the

⁵⁵Ibid., p. 4.

⁵⁶Ibid., p. 23.

city, dock and storage area available, the economic characteristics of the region, the extent of railroad freight service available, the commodities to be handled, location of the structure, size of the vehicles involved, and availability of alley loading space. Actual field checks over a period of time of the number and types of vehicles loading and unloading at the various types of establishments are very helpful in determining the basic requirements of off-street facilities for each type of land-use. The city at this time must decide whether it will require an "optimum minimum" of off-street facilities or the amount necessary to take care of the maximum requirements.⁵⁷ The extent of facilities required should be based upon the city's existing traffic conditions and its future traffic plans.

2. All land-uses that regularly require loading and unloading operations should be required to provide the necessary off-street facilities.

3. The requirements for off-street facilities should be applied to the land-uses throughout the city rather than limited to those in certain areas of the city.

4. Berth sizes required should be adequate for the maximum size trucks utilizing them.

5. Adequate access and maneuvering space should be provided on the premises as a part of the off-street facilities

⁵⁷Kenneth Green, "Loading Experience As a Basis for Zoning Requirements," Traffic Quarterly, 7 (October, 1953), p. 512.

required.

6. Separate facilities for loading and unloading are often advisable where large volumes of freight are handled. Along the same line, Robert K. Morrow of Dixie Highway Express, Incorporated, pointed out to the writer the need in many cases for separate facilities for handling full truckload and less-than-truckload freight. If all berths are taken up by full truckload operations, all deliveries of small shipments may be blocked for a considerable period of time.

Improved terminal facilities.-- An important development from the standpoint of truck congestion alleviation is the present trend toward construction of modern terminal facilities in outlying areas. More and more truckers are moving out of their inadequate facilities in close-in congested areas into new terminals with adequate space for their operations. In Atlanta, new terminals are being developed in clusters along major thoroughfares in outlying areas. An example is Dixie Highway Express, Incorporated, which is moving from its present outgrown terminal facilities to a new terminal being constructed on a 26 acre site located farther out from the central area of the city on an important traffic artery. Its new site is adjacent to the new terminals of several other carriers.

These new terminal facilities are generally of the latest design and include the most modern freight handling equipment. Most of them are constructed in a "T" shape with loading and unloading berths along both sides of the long wing, and the neces-

sary office facilities at one end forming the crossbar to the "T". As a rule, the over-the-road type trucks load and unload on one side of the long dock and local delivery trucks on the other side. Two general types of freight handling equipment are available for the modern trucking terminal, according to the individual needs and preferences. Some use the fork-lift truck and pallet system, and others use a conveyor system. Under the first system, freight unloaded off trucks is simply stacked on wooden pallets which are then moved by a fork-lift truck to a storage area or across the dock to be loaded on another truck. The conveyor system consists of an endless belt either moving overhead or in a slot in the floor for the length of the dock. Freight unloaded off trucks is placed on small platform trucks or dollies which are attached to the belt and moved to the desired area for storage or loading on another truck. The conveyors are also known as draglines or "merry-go-rounds."⁵⁸

Site selection is one of the most important factors in the development of new terminal facilities. An area of adequate size that is reasonably priced is required. This generally means that the location must be in an outlying area. The area must also have access to major traffic arteries. Site preparation costs are also an important factor. The site must be reasonably close

⁵⁸"The Terminal; Truckers Change Their Ways," Business Week (August 4, 1951), p. 72.



Figure 4. Modern Truck Terminals

to a majority of the carrier's customers. If it is far out, the travel time for local pickup and delivery trucks is too great.

Advantages from the congestion alleviation standpoint of the new trend in terminal facilities include:

1. The new terminals generally have adequate space so that all loading, unloading, and storage of vehicles is taken care of on the premises.
2. The outlying locations keep a large number of the huge over-the-road type trucks off the congested streets in central areas.
3. When several terminals are established in the same general area, the congestion resulting from interline freight movements for the carriers involved is greatly reduced.

There are several shortcomings or deficiencies in this trend which keep it from resulting in as much congestion alleviation as would be desirable. These include the following:

1. There is no guarantee that an individual carrier will locate its new terminal in an area most desirable from the standpoint of congestion alleviation. Most zoning ordinances give wide leeway in the location of terminals and treat them along with general industrial or commercial uses. As a result, new terminal facilities may be haphazardly located in already congested areas or areas with inadequate street facilities if the carrier involved is more interested in other factors than in congestion alleviation.

2. Even in outlying areas, some congestion may result when terminals are located along a traffic artery not designed for heavy truck traffic.

3. Many of the smaller carriers cannot afford to move into new outlying terminal facilities, and most of the larger carriers can afford them in only a few of the cities they serve. Therefore, a considerable number of inadequate terminals, often in congested areas, will remain.

In spite of the above deficiencies, the overall trend toward improved terminal facilities is a very important step toward alleviation of truck congestion. Most of its existing shortcomings can be eliminated or greatly reduced through more adequate treatment of truck terminals in zoning ordinances. Ordinances should be more specific in their requirements for terminals to insure that they will be located in areas best suited to their requirements of access and adequate space for all phases of their operations. The zoning ordinance should specify the type of street facilities to which a terminal must have access. Consideration should be given to the rezoning of congested close-in areas so that terminals in these areas would become nonconforming uses and could be eliminated over a period of time.

Consolidated truck terminals.-- The consolidated truck terminal is another device for alleviating the congestion resulting from truck operations. Essentially, a consolidated terminal is any terminal that serves two or more carriers. In 1949, there were

69 consolidated terminals throughout the country, ranging from one that served four carriers to one that served 56 carriers.⁵⁹

There are no major differences in the design and site requirements for consolidated terminals and terminals of individual carriers. The modern consolidated terminal generally has the same "T" shape and the same types of freight handling equipment discussed previously for the single carrier terminal. Site requirements are virtually the same for both types of terminals except for the fact that the needs of several carriers must be considered in locating a consolidated terminal.

Consolidated terminals are generally known as either joint terminals or union terminals. In a joint terminal, carriers may rent space from another carrier who owns the terminal; share the terminal as a member of a cooperative association of carriers; or lease space from a private terminal company. Each carrier does its own freight handling in the terminal and takes care of its own pickup and delivery services, either with its own equipment or through contract with a local delivery firm.⁶⁰

In a union terminal, carriers rent space from the terminal operator which might be a private or a public agency. The terminal operator generally provides a complete range of services such as freight handling, storage, pickup and delivery, and sometimes even

⁵⁹Taff, op. cit., p. 191.

⁶⁰Cincinnati City Planning Commission, op. cit., p. 44.

billing and bookkeeping for the tenant carriers. All the terminal employees work directly for the terminal operator rather than for the carriers. The terminal operator generally contracts with local cartage companies to perform the pickup and delivery services for the terminal as a whole.⁶¹

The New York Union Motor Truck Terminal, opened November 1, 1949, by the Port of New York Authority, is probably the most widely known consolidated terminal in operation. It is frequently cited as a model for a modern consolidated terminal. Located only four blocks from the Holland Tunnel, it is presently utilized by 11 carriers. It is estimated that approximately 800 trucks a day move in and out of the terminal. Approximately 1,000 tons of less-than-truckload freight a day are handled across its 800-foot-long platform. Its capacity is 2,000 tons per day on a 24 hour basis. Eighty over-the-road and 56 local delivery trucks can be handled at the dock at one time. A number of bays are set aside for the use of shippers who wish to deliver their freight to the terminal in their own trucks. Freight is handled by an overhead conveyor or dragline, and an overhead crane and fork-lift trucks are available to handle exceptionally heavy or bulky freight. Trucks can be moved by high speed elevators to the roof where 115 trucks can be parked.⁶²

The Port Authority turned over direct operation of the

⁶¹Loc. cit.

⁶²"Saving Days and Dollars for Shippers," Via Port of New York, 6 (November, 1954), pp. 1-4

terminal to the Empire State Truck Terminal Company, Incorporated, which was formed by the tenant carriers in January, 1953, and assumed control of the terminal on March 1, 1953. The company contracts with local cartage companies for local pickup and delivery operations. Each cartage company handles the pickups and deliveries in a specified area.⁶³

Although it was definitely a union truck terminal while operated directly by the Port Authority, the terminal now appears to be a combination union and joint terminal. The consolidated pickup and delivery system for the terminal as a whole is characteristic of the union terminal. However, under the new management, each carrier is responsible for its own freight handling operations, which is characteristic of the joint terminal. Each carrier also has its own dispatching and office personnel. While the terminal still uses "Union" in its name, it appears that it now would be more logically classified as a joint terminal.

It is difficult to determine which type of consolidated terminal has been most successful. Whether the changes in the Port Authority terminal were because of inherent defects in the union type of terminal or of inefficiencies on the part of the Port Authority's operating methods is not known. It is known that the Port Authority had considerable trouble with truckers' unions, uneven scheduling of over-the-road loads, training of its labor force, excessive paper work and other

⁶³Ibid., pp. 2-3.

operational defects, and the "rugged individualism" on the part of the carriers themselves.⁶⁴ It is important to note that the consolidated pickup and delivery service was retained. There is no doubt that joint terminals far outnumber union terminals. However, the union terminal is a much later development as well as much more difficult to set up and operate. Perhaps it has not yet been given a fair chance.

The specific type of consolidated terminal involved is not of great importance from the standpoint of congestion alleviation except for one aspect, and that is whether or not consolidated pickup and delivery services are utilized. Otherwise, the essential differences between union and joint terminals are in the actual internal terminal operations and have no particular influence on traffic congestion.

Consolidated terminals in general have a number of advantages in addition to the advantages previously discussed for modern terminals of individual carriers. These include:

1. Interline freight between the carriers in the terminal is simply moved along the dock from one carrier to another rather than being transported through congested city streets.

2. Trucks deliver freight for all the carriers in the terminal by making a single trip rather than making calls at a number of individual terminals. The same is true for firms

⁶⁴American Society of Planning Officials, Motor Truck Terminals, Planning Advisory Service Information Report No. 21 (Chicago, 1950), p. 14.

that pickup their incoming freight at the terminal.

3. Small carriers who cannot afford a modern terminal of their own and other carriers whose operations in a particular city do not warrant maintaining a modern terminal can afford to utilize a consolidated terminal. This helps to eliminate many inadequate, close-in terminals.

4. Where consolidated pickup and delivery services are utilized, a large amount of congestion is alleviated as a result of the smaller number of pickup and delivery vehicles on the streets. Consolidated pickups and deliveries are discussed more fully in a later section.

5. Consolidated terminals generally reduce overall operating costs to the carriers through elimination of duplication of facilities, reduced interline costs, central purchasing of supplies, and reduced capital investments.

There are no serious disadvantages of the consolidated terminal from the standpoint of congestion. The only cases where a consolidated terminal might create congestion in a limited area are when it is badly located in respect to adequate street facilities; when it is located in an already congested area; or when the access and egress points are badly located.

There are certain existing obstacles and shortcomings that must be overcome in the establishment and operation of consolidated terminals. One obstacle to consolidated terminals

in general is the "rugged individualism" of the carriers mentioned previously in connection with the New York Union Motor Truck Terminal. The writer in his interviews with trucking officials found this attitude very prevalent. Most truckers feel that they offer a personalized service to their customers and fear losing their identity in a consolidated terminal. The competition is very keen between the various carriers, and carriers who feel that they have superior methods of operation do not want their competitors to be in a position to benefit from them.

Joint terminals often have serious shortcomings resulting from the fact that freight handling operations are carried on by personnel of a number of different carriers on the same dock area. Robert K. Morrow of Dixie Highway Express, Incorporated, who has had considerable experience with operations in a joint terminal, was very helpful to the writer in discussing the operations of joint terminals from the viewpoint of the carriers. Some of the shortcomings of joint terminal operations are as follows:

1. The pilferage of merchandise is likely to become a serious problem with the freight and personnel of a number of carriers in the same area.
2. There is likely to be theft and exchanging of truck parts and equipment by the personnel of the various carriers.
3. The inefficient operations of one carrier can handicap the operations of all the others.

4. The likelihood of accidents is increased when many freight handling operations of different carriers are carried on in the same area with no overall supervision.

5. There is an increased likelihood of loss and damage to freight since each carrier is mainly interested only in its own freight.

The major obstacles to the establishment and operation of union truck terminals include the following:

1. It is very difficult to acquire the large sums required to finance the construction of a union terminal. The returns from union terminals are generally not high enough to attract the necessary venture capital.

2. Union terminal operations are complicated and require highly trained personnel.

3. Finding or training the necessary personnel is a serious problem.

4. Some carriers do not feel that they can operate efficiently unless their own personnel carry on their terminal operations.

5. Carriers are afraid of having their operations paralyzed by a strike of terminal employees.

It is recognized that some of the shortcomings of the consolidated terminal are serious, but most of them can be eliminated or considerably reduced through appropriate action. The "rugged individualism" and jealousy among carriers is an important factor, but it can be overcome to a considerable ex-

tent over a period of time if the overall benefits of consolidated terminals are recognized by the carriers. The pilferage problem in joint terminals can and has been greatly reduced in some cases through an effective security system. The new management of the New York Union Motor Truck Terminal claims that its security system is so efficient that it has a better record than the average private terminal as far as pilferage is concerned.⁶⁵ A large joint terminal in Chicago utilizes removable wire screens to separate the space occupied by each tenant carrier. This separates the freight handling activities of each carrier and eliminates most of the shortcomings enumerated for joint terminals. Dock operations for each individual carrier are side-by-side rather than across the dock, which is the usual terminal method. A center aisle down the length of the terminal is used for movement of interline freight.⁶⁶

The problem of financing union truck terminals can be solved through construction by a public agency as was done by the Port of New York Authority for its New York Union Motor Truck Terminal and its Newark Union Motor Truck Terminal. Public construction could be justified in many cases on the basis of congestion alleviation. As pointed out by Philip G. Hammer

⁶⁵"Saving Days and Dollars for Shippers," p. 4.

⁶⁶Taff, op. cit., p. 191-192.

of Hammer and Company, Business and Economic Consultants, construction of a union terminal by a public agency through the issuance of revenue certificates is entirely feasible in many cases both from the standpoint of serving a public purpose and from the standpoint of paying for itself or perhaps yielding some profit over a period of time.

Other authorities feel that private financing could be achieved under certain conditions. A study for a union truck terminal for Atlanta pointed out that the only practical way of financing such a terminal through private enterprise would be for interested carriers to put up a substantial portion of the capital. This study also recommended that a public agency acquire the necessary land and lease it to the private terminal operator at an annual rental based on the net revenues of the terminal. This system would keep the private operator from having to pay taxes on the land.⁶⁷ In most cases, it appears that private union terminals would require considerable public aid in the form of rezoning the necessary land, making the required street changes, acquiring land in blighted areas, or tax concessions.

From the standpoint of overall congestion alleviation, a consolidated terminal is definitely superior to a number of indi-

⁶⁷H. W. Lockner and Company and De Leuw Cather and Company, Union Truck Terminal Plan for Atlanta, Georgia, Prepared for the State Highway Department of Georgia and the United States Public Roads Administration (Chicago, 1946), p. 18.

vidual terminals, especially if consolidated pickup and delivery services are utilized. It is the opinion of the writer that in spite of their importance, it is not likely that consolidated terminals will or should replace all individual terminals especially in the larger cities. Some existing individual terminals are so large that it does not appear feasible to combine their operations with those of other carriers in a still larger terminal. It appears that the chief value of consolidated terminals is to serve a number of carriers whose operations in a particular city are on a moderate or small scale. The economy and efficiency of a consolidated terminal might overcome the desire of these carriers to maintain their own terminal facilities. Success of any consolidated terminal is more likely if the service performed by the tenant carriers is noncompetitive.

Truck terminal districts.-- The establishment of truck terminal districts has been recommended by some authorities as an important congestion alleviation measure. One method by which such districts may be established is through the zoning of certain areas as truck terminal districts and requiring all terminals to be located in these areas. As a rule, all land uses not directly connected with trucking activities would be excluded from such districts. Another method of establishment is through the acquisition and preparation of the necessary land for the district by a public or private agency. The agency would then sell or lease sites or facilities to carriers and

other types of business desired in the district. The extent and number of such districts required for a particular city would depend upon such factors as the size of the city, its land-use and street patterns, and the amount of trucking activity carried on.

Although truck terminal districts may vary from an area simply set aside under the zoning ordinance to the most elaborately planned and designed area, they do have certain features in common. A comparatively large area of land is required for a truck terminal district, which should allow adequate space for all the required facilities as well as for future expansion. The district should be adequately served by internal roadways for easy circulation and should have adequate access to the major traffic arteries in the area. Facilities generally allowed in a truck terminal district include terminals of individual carriers, consolidated terminals, parking areas, warehouses, repair shops, related commercial and office facilities, and other facilities required for the convenience and use of the carriers.

The Mayer's Committee on Motor Truck Terminals created in Chicago in January, 1949, recommended the establishment of four truck terminal areas in that city. The locations of these areas were based upon a study of the land available adjacent to the city's proposed "superhighways" and the locations of the largest concentrations of shippers and receivers in the city. As the location of each proposed district was determined, it

was recommended to the city council to be zoned as a terminal area. The Chicago Zoning Ordinance was amended on May 25, 1950, to provide "Truck Terminal Area No. 1."⁶⁸ The remaining terminal areas recommended have since been added to the zoning ordinance. Following the establishment of the terminal areas, construction of terminals outside these areas was prohibited.⁶⁹ Uses allowed in a truck terminal area under the provisions of the Chicago Zoning Ordinance include hotels, restaurants, retail stores, pharmacies, barber and beauty shops, union headquarters, taverns, warehouses, motor terminals, rail terminals, water terminals, liquor stores, truck garages, parking lots, new and used truck sales, filling stations, public garages, signs other than billboards, parcel delivery stations, private ways for ingress and egress to permitted uses, banks, and auxiliary uses.⁷⁰

The truck terminal district appears to combine most of the important advantages of the consolidated terminal in addition to overcoming some of the major shortcomings of the consolidated terminal. Some of the advantages of the truck terminal district include:

1. The handling of interline freight between the carriers located in the terminal district is carried on entirely within the district with a minimum of hauling.

⁶⁸American Society of Planning Officials, op. cit., p. 16.

⁶⁹Hirsch, op. cit., p. 180.

⁷⁰American Society of Planning Officials, op. cit., pp. 19-20.

2. Consolidated pickup and delivery services can be operated for the district as a whole or on a lesser scale.

3. Terminal districts do not require the huge sums involved in the construction of large consolidated terminals.

4. Facilities can be easily expanded to meet future needs if the district is large enough.

5. By spreading its operations over a larger area, there is less likelihood of any localized congestion problem than there is for consolidated terminals.

6. Terminal districts allow carriers to purchase or lease sites and construct and operate their own individual terminal facilities. This overcomes the major objection of carriers to consolidated terminals. Carriers can benefit from being located in close proximity to other carriers and still maintain their all important individuality. This fact was pointed out in the Chicago study and was verified by the writer's interviews with trucking officials in the Atlanta area. While almost unanimously opposed to consolidated terminals, they all expressed themselves as being in favor of terminal districts. One carrier official declared that he was completely in favor of being located in a terminal district if he could fence his own terminal facilities for security.

7. Terminal districts have room for a far greater range of services and auxiliary facilities than a consolidated terminal.

8. In cases where there is a need for consolidated terminals, they can be located in the existing terminal districts.

The Chicago study recognized that the establishment of truck terminal areas under the zoning ordinance did not solve the problems of the numerous small carriers who do not have the resources to construct their own terminal facilities in these areas. In Chicago, off-street parking lots for trucks were proposed to meet these carriers' needs.⁷¹ Such parking facilities or possibly consolidated terminals could be established within the terminal district to meet the special requirements of the smaller carriers.

The greatest dangers in the establishing of truck terminal districts are not inherent in the districts themselves, but could result from inadequate planning and regulation.

These include:

1. Selection of sites of inadequate size.
2. Selection of sites without access to major traffic arteries.
3. Selection of sites with unsuitable topography.
4. Selection of sites badly located in relation to the major concentrations of shippers and receivers of freight.
5. Selection of sites already built-up with uses undesirable for a truck terminal district.
6. Selection of sites with inadequate internal circulation facilities.
7. Allowing the district to become overrun with nones-

⁷¹ Hirsch, op. cit., p. 182.

sential uses.

To guard against these dangers, it is recommended that sites for terminal areas be designated as a part of an overall plan for the particular community and that the zoning provisions regarding uses allowed in a terminal district be carefully drawn so as to exclude uses that do not contribute to the trucking operations to be carried on in the district.

It is felt that the establishment of special terminal districts has great possibilities as a future major congestion alleviation measure in cities of widely varying sizes. Such districts may be patterned to fit the needs and desires of the particular city with regard to such factors as location, number, size, and extent of facilities. In addition, terminal districts have the support of the truckers themselves.

Truck routes.-- Cities have used truck routes as a means of controlling truck traffic movements for a considerable number of years. Under a truck route system, trucks are generally allowed to operate on specifically designated streets and are banned from the remaining streets in the community. As a rule, the trucks restricted to truck routes are the large over-the-road type and through trucks which do not have a destination in the city. Small pickup and delivery trucks are usually allowed on any street required in their operations.

The power of cities to establish truck routes is generally well recognized and has been upheld by the courts in a number of cases. In Garneau v. Eggers, the Supreme Court of New Jersey,

in upholding a truck route ordinance in Jersey City, said:

The regulation of all commercial vehicles on particular streets even to their complete exclusion therefrom, when deemed necessary in the public interest, is within the police power delegated to municipalities, and, even though such regulation may be considered drastic in its operation, a court is not at liberty to substitute its judgment for that of the municipality as to the best and most feasible manner of curing traffic evils and traffic congestion in a specified area in the interest of the welfare of the inhabitants and the persons who use the highway, where such regulation bears a direct relationship to the public safety and is reasonable and not arbitrary.⁷²

Most cities utilizing truck routes designate such routes by appropriate signs and markers. One of the most widely known marked truck route systems was established in 1952 in Buffalo, New York. The Buffalo ordinance specifies the method of marking truck routes as follows:

All streets forming part of such truck route systems shall be marked by conspicuous signs bearing the words "truck route" in letters not less than five inches in height, such signs to be spaced not more than 1500 feet apart. In addition, conspicuous signs bearing lettering not less than 5 inches in height, adequately illuminated between sunset and sunrise, or to be constructed of a reflecting material, so as to be easily readable at night when lights from vehicle headlights fall upon such signs, shall be placed on each main highway entering the city, at or near the point where such highway crosses or meets the boundary line of the city, indicating that trucks have a weight in excess of five tons, including load, are excluded from all streets within the city, except those streets

⁷²Garneau v. Eggers, 113 N. J. L. 245, 248, 249, 174 A. 250 (Sup. Ct. 1934).

designated as part of the authorized truck route system.⁷³

Other cities do not specifically designate truck routes by signs and markers, but furnish the truck route regulations and maps to the truck operators in the city. Under this system, it is up to the individual operators to specify the routes their drivers take in conformance with the provisions of the truck route ordinance. This type of ordinance was passed in 1941 in St. Paul, Minnesota.⁷⁴ This system saves the expense of installing and maintaining signs and markers and may be placed in operation very quickly. This system is not felt to be practical in smaller cities where a large part of the truck traffic is made up of through trucks and trucks of carriers not maintaining terminal and office facilities within the city.

One widely used variation of the conventional truck route system is the system under which trucks are free to use any street not specifically banned to them. This system is sometimes based upon truck sizes, especially in residential areas or in congested downtown areas. Trucks are free to choose their own routes as long as they keep off streets specif-

⁷³ Henry W. Osborne, "The Buffalo Truck Route System," Traffic Quarterly, 7 (July, 1953), p. 415.

⁷⁴ Joseph C. Ingraham, Modern Traffic Control (New York: Funk and Wagnalls Company, 1954), pp. 261-262.

ically closed to them. In some cities, only local trucks have this privilege, and through trucks are limited to definite truck routes. This system may be used as a temporary measure to alleviate the most critical congestion problems pending the establishment of a conventional truck route system.

It was the practice at one time, particularly in the smaller cities, to attempt to require all through trucks to by-pass the city completely. The trend today is to allow such trucks to come through the city, but to by-pass the central area. An exception is the increasing number of cities that require trucks carrying explosives and inflammable materials to go around the city. One of the latest cities to adopt such an ordinance was Amarillo, Texas.⁷⁵

A modern variation of the by-pass idea, which is receiving increasing attention in traffic planning, is a system of concentric circumferential highways also known as "beltlines" or "ring-roads." In Decatur, Illinois, this system has been very successful, with many terminals locating on the circumferential highways for convenience in distribution.⁷⁶ Trucks

⁷⁵C. Harold Miller and A. G. Atkin, "Amarillo's Operation Traffic," Traffic Quarterly, 7 (April, 1953), p. 234.

⁷⁶G. Donald Kennedy, Modern Urban Highways (Washington: Conference Committee on Urban Problems, n. d.), p. 22.

can use these highways to by-pass congested areas of cities completely or to drive to the point nearest to their destination in the city before turning off. Other cities known to be including a system of circumferential highways in their future traffic planning are Atlanta⁷⁷ and Baltimore⁷⁸.

While most truck routes are conventional multiple purpose streets similar to the other streets in the city, some of the larger cities have constructed separate truck routes as such. Such routes were recommended for Los Angeles as early as 1924.⁷⁹ These early specially constructed truck routes were usually proposed in order to completely segregate the different types of traffic. In the 1920's Detroit constructed some highways that provided separate roadways for passenger cars and trucks in the same right-of-way.⁸⁰ Certain streets in New York City were set aside for exclusive commer-

⁷⁷Atlanta, Georgia, Is on the Way to Congestion Relief," The American City, 70 (April, 1955), p. 138.

⁷⁸Planning Commission of Baltimore, Traffic and You (1950), p. 15.

⁷⁹Frederick Law Omlsted, Harland Bartholomew, and Charles Henry Cheney, A Major Street Plan for Los Angeles, Prepared for the Committee on Los Angeles Plan of Major Highways of the Traffic Commission of the City and County of Los Angeles (1924), p. 20.

⁸⁰Harold M. Lewis, "Routing Through Traffic," The Annals of the American Academy of Political and Social Science, 132 (September, 1927), pp. 25-26.

cial use as early as 1927.⁸¹ Another segregation method often proposed for congested areas is the construction of two-level streets with one level set aside for passenger car use and the other for trucks. Truck tunnels have been recommended for some limited areas to take loading and unloading operations off the street or surface level by bringing trucks to underground loading platforms. Several of the larger shopping centers, including the Broadway-Crenshaw center in Los Angeles and the Northgate center at Seattle have such tunnels in operation.⁸²

Today the trend is away from complete segregation of the various types of vehicles although a few authorities are still in favor of it. Complete segregation is generally felt to be completely unrealistic in view of the tremendous costs involved. However, most authorities do recommend, especially in the larger cities, that major truck routes be constructed or improved with extra heavy pavements, extra wide lanes, low gradients, and avoidance of congested areas to fit the requirements of truck traffic.

Most authorities recommend that all urban expressways be constructed to truck route standards. Since expressways are already characterized by low gradients, fairly heavy pave-

⁸¹Harold M. Lewis, Highway Traffic, Vol. 3, Regional Survey of New York and Its Environs (New York: Committee on Regional Plan of New York and Its Environs, 1927), p. 94.

⁸²National Research Council, op. cit., pp. 35-38.

ments, fairly wide lanes, and adequate sight distances, it is considered logical from the standpoint of overall economy to spend the additional amounts necessary to bring them up to truck route standards rather than to incur the tremendous expense of providing separate truck routes paralleling them. As pointed out in Motorways, published by the City Planning Commission of Cincinnati, "In short, the expressway system is inherently intended to serve all types of motor vehicular traffic."⁸³

The major advantages of a well-planned truck route system are as follows:

1. Heavy truck traffic, with its noise and hazards, is removed from most residential streets.
2. The wear and tear of truck traffic on the average city street is reduced. By restricting heavy truck movements to designated streets, the city can more easily provide and maintain the heavy-duty, wide pavements needed for truck traffic.
3. Truck operators benefit by having a better and more direct route which saves them time and money. All the truck operators interviewed by the writer expressed themselves as favoring adequate truck routes as aids to their own operations.

⁸³Cincinnati City Planning Commission, Motorways, Cincinnati Metropolitan Master Plan Study (1947), p. 92.

4. The overall traffic situation is improved by routing heavy truck traffic around congested areas.

Although there are no major disadvantages to a well-planned truck route system, some groups suffer to varying degrees even with the best designated truck routes. One such group is residents on a street selected as a truck route. It is often impossible to have truck routes completely avoid residential areas. In Blumental v. Cheyenne,⁸⁴ the court, in ruling against a group of residents along a truck route who sought to have the truck route ordinance declared invalid, pointed out that it could sympathize with the residents but that the inconvenience and discomfort resulting from the heavy truck traffic was "one of the less happy by-products of the progress of modern civilization."⁸⁴

Some types of truck operators also suffer considerably from even the best truck routing systems. One such group, as pointed out by Karl A. Bevins, head of the Atlanta Traffic Engineering Department, is the operators of heavy construction trucks whose work takes them in all areas of the city. Since the law requires that they must go as close as possible to their destination on a truck route before turning off and return the same way, they often must travel long and round-about ways from one job to another in order to stay on truck routes. In spite of the disadvantages to some groups, it is felt that they are far outweighed by the overall advantages

⁸⁴Blumental v. Cheyenne, 64 Wyo. 75, 186 P. 2d 556 (1947).

of truck routes.

The greatest shortcomings of a truck route system are not inherent, but result from establishment of a system that does not fit the needs of the particular city. Generally this results from the selection of streets as truck routes without regard to the particular characteristics a truck route should have or from selection of streets which cause the fewest and least important complaints from property owners. The latter is a very real problem. Often trucks are excluded from streets best suited for their use as a result of the demands of property owners. In Atlanta, property owners along a street critically needed as a part of the city's truck route system were able to bring enough pressure to bear on the city government to keep it from being included in the system. In some cases, a truck route system may actually result in worse traffic conditions by restricting trucks to streets which are completely unsuited for their use.

An adequate truck route system is needed in most urban areas which have moderate or heavy truck traffic volumes. Any truck route system should be based upon extensive studies of actual needs from the standpoints of preventing traffic congestion, protecting property, and best serving the truck operators. Truck routes should be selected on the basis of such factors as gradients, pavement thickness, width, directness, and avoidance of congested areas. Wade Sherrard, General Manager of the Motor Truck Association of California, stated

the general view of truck operators in regard to truck routes as follows:

The truck operator is always more concerned with the grades, density of traffic, uninterrupted operation, and distance involved than he is in whether or not he is to be permitted over Route 'A', 'B', or all available streets. From a theoretical standpoint, the best possible solution to the routing problem would be to use only one value in determining whether or not commercial vehicles should be permitted to use a street. That value is adequacy in its broadest sense.⁸⁵

Establishment of an adequate truck route system is often not an easy task. The city should be well aware that opposition is likely to arise from property owners, businessmen, and truck operators if any of them feel that they are being damaged by it. A good public relations and education program is often essential to the successful establishment of an effective truck route system.

Limitation of truck sizes in central areas.-- Some cities have turned to truck size limitations in order to reduce congestion in central areas. This type of ordinance generally prohibits the use of large over-the-road trucks to make pick-

⁸⁵Wade Sherrard, "Trucks -- Routing, Speed, Noise, and Smoke," Proceedings of the Fourth California Street and Highway Conference, University of California at Los Angeles, February 6-8, 1952 (Berkeley, California: The Institute of Transportation and Traffic Engineering, University of California, 1952), p. 114.

ups or deliveries in downtown areas during regular business hours. These limitations may be based on the weight, length, or the specific type of truck. In 1954, Chicago passed an ordinance prohibiting the operation of trucks longer than 33 feet in the Loop area.⁸⁶ New York City also prohibits the use of trucks longer than 33 feet in its garment area.⁸⁷ Robert K. Morrow of Dixie Highway Express, Incorporated, informed the writer that Birmingham, Alabama, prohibits the use of tractor-trailers in its central business district between 7:00 A. M. and 6:00 P. M. Atlanta has a similar ordinance applying to tractor-trailers, with the provision that such units may be allowed in the restricted area to load or unload if a special permit is obtained from the Traffic Division of the Police Department. A similar ordinance was recommended in a special study made of trucking operations in Charlotte, North Carolina.⁸⁸

The advantages in alleviating congestion resulting from prohibiting the use of the larger trucks in congested central areas are too obvious to require enumeration. The only large trucks that could possibly have any justification

⁸⁶"Chicago Restricts Truck Movements in the Loop," Competitive Transportation Review, 6 (April, 1954), p. 7.

⁸⁷Walter Arm, New York's Traffic Mess, A Six-Part Survey, Reprinted from the New York Herald Tribune, June 27-July 3, 1955, p. 3.

⁸⁸City of Charlotte, North Carolina, op. cit., p. 14.

for being in the central business district are those that have pickups or deliveries to make there. Truck operators interviewed by the writer were aware of the overall value and necessity of such restrictions and had no major objections to them. However, one carrier official did feel that such regulations sometimes work a hardship on carriers when full truckload shipments for establishments in the downtown area are involved. If the large over-the-road trucks are excluded, the incoming shipments must be unloaded off these units onto several small units for delivery. The same applies in reverse if a full load pickup is involved since several smaller trucks must pick up the freight which is then loaded on a large over-the-road unit at the terminal. This official felt that the Atlanta system of granting special permits in cases where the regulations would work unusual hardships was fair to all concerned.

Limitation of truck sizes appears to be fully justified in cities where large trucks in central areas are an important congesting factor. It is up to the individual city to determine the extent of the area to be included and the specific provisions of the ordinance in regard to such matters as the types or sizes of trucks to be prohibited and the hours of application. The writer would recommend the permit system in order to take care of cases where special hardship would result if the ordinance were carried out to

the letter. However, it should be remembered that abuse of the permit system could virtually nullify the purposes of the ordinance.

Regulation of loading and unloading hours.-- The regulation of curb loading and unloading hours is receiving increased attention as a congestion alleviation measure. A study of 540 cities revealed that 44 per cent of them employed this measure.⁸⁹ This measure generally involves the prohibiting of curb loading and unloading during the morning and afternoon rush hours. Atlanta bans all curb loading and unloading on designated streets between the hours of 7: A. M. and 9:00 A. M. and 4:00 P. M. and 6:00 P. M. New York City prohibits all loading and unloading operations along certain major streets during the morning and afternoon rush hours, but provides special loading zones on side streets just off these major streets where loading and unloading can be carried on while the major streets are cleared of such activities.⁹⁰ Denver has found that if all parking is prohibited during rush-hour periods, it can allow curb loading and unloading in the middle of blocks during the morning rush-hour period without seriously interfering with traffic flow. Dur-

⁸⁹Evans (ed.), Traffic Engineering Handbook, p. 307.

⁹⁰T. T. Wiley, "New York City Starts Tightening on Truck Loading," The American City, 68 (April, 1953), p. 135.

ing the afternoon rush-hour period, only Post Office and Railway Express trucks are allowed to stop at the curb.⁹¹

The major advantages of regulating curb loading and unloading hours are as follows:

1. The congestion resulting from trucks parked at the curb or maneuvering into a curb loading space is eliminated. This opens up the curb lane for moving traffic.

2. The number of trucks moving in rush-hour traffic streams is considerably reduced allowing faster and more efficient movement of traffic.

3. Truck operators benefit since off-peak operations are much more efficient and less time consuming than rush-hour operations. None of the carrier officials interviewed by the writer had any objections to regulation of hours since the restrictions apply to all alike. As pointed out by Charles L. Skinner, Director of Information of the Georgia Motor Truck Association, there is generally a costly lag in pickup and delivery operations between 11:00 A. M. and 4:00 P. M. daily so that the carriers benefit from the morning and afternoon rush-hour restrictions which cause pickups and deliveries to be spread more evenly over the day. Carriers also save because they can work their drivers shorter hours and trucks are back to the terminal for unloading earlier.

⁹¹Evans, "Six Bargain Steps to Smoother Traffic," pp. 70-71.

The greatest opposition to regulation of curb loading and unloading hours comes from shippers. As discussed previously, many shippers tend to wait until the end of the work day to have their freight picked up. Regulation of loading and unloading hours means that shipments must be ready earlier and that some freight must be held overnight for the next day's pickup. Therefore, all freight is not shipped at the end of each work day as many shippers desire.

It is felt that the overall advantages of this measure, both from the congestion alleviation standpoint and from the truck operators viewpoint, far outweigh the small inconvenience it causes to shippers. As a rule shippers are able to make the necessary adjustments in their operations without any great difficulty. W. E. Gibson, Assistant Terminal Manager of the Great Southern Trucking Company's Atlanta terminal, stated that his company had received good cooperation from shippers regarding earlier pickups after they realized that it was impossible for any carrier to pick up their freight during the rush hour periods. Other carrier officials made similar statements.

Consolidated pickups and deliveries.-- Consolidated pickups and deliveries were mentioned as a congestion alleviation measure in the discussion on joint truck terminals. Under this system, the same truck makes pickups and deliveries for more than one carrier. Probably the most simple form of consolidated pickups and deliveries is the system operated by carriers on a

cooperative basis where trucks of each participating carrier pickup and deliver freight for all the others, usually on an alternating basis. Another type is performed by local cartage operators under contract with carriers or with terminal operators.

A successful consolidated freight pickup system in operation in St. Louis, Missouri, is described by Austin C. Knetzger in the July, 1951, issue of the Traffic Quarterly as follows:

Local cartage carriers have individual contracts, bargained for as a unit, with railroads, truck lines and forwarding companies, under which they perform principally pickup service for these forms of transportation. Under these arrangements, the cartage carriers place equipment at a shipping dock and the shipper's entire output is loaded directly to the cartage equipment. This will include freight in pickup service, local city deliveries, and could include parcel post, express, air freight and inter-plant movement on the same truck.⁹²

The St. Louis system applies to the pickup of freight only. Delivery of inbound freight is handled by the individual carriers either in their own equipment or through individual contracts with local cartage firms.⁹³

The motor carrier officials interviewed by the writer were unanimously opposed to consolidated pickups and deliveries.

⁹²Austin C. Knetzger, "Fitting Truck Movement Efficiently into the Traffic Problem," Traffic Quarterly, 5 (July, 1951), p. 318.

⁹³Ibid., p. 319.

This appeared to be part of the same individualism that causes motor carriers to desire their own private terminal facilities rather than a consolidated terminal.

The major advantages of consolidated pickups and deliveries are:

1. The number of pickup and delivery trucks on the streets is greatly reduced.
2. The number of pickup and delivery stops required is considerably reduced. This reduces congestion at the loading and unloading docks of freight shippers and receivers.
3. The costs of pickup and delivery operations to the carriers are reduced.

While there are no disadvantages of consolidated operations as far as traffic congestion alleviation is concerned, truck operators and shippers and receivers of freight feel it has the following disadvantages from the standpoint of their operations:

1. Operations are generally slower than those carried on by individual carriers, especially for deliveries and to some extent for pickups. As was pointed out by Karl A. Bevins, head of the Atlanta Traffic Engineering Department, unless all the carriers in a particular city participate in the consolidated operations, some shippers and receivers will change carriers so as to be served by a carrier who operates its own pickup and delivery service in order to have faster service.

2. Most carriers feel that they offer a personalized service in which the pickup and delivery driver is the major contact with their customers. Therefore, they feel that to give up their own pickup and delivery operations breaks their major contact with their customers and that they become just one of a number of truck lines with no individuality and no real basis upon which to solicit business.

3. There is the danger that a strike of the consolidated pickup and delivery personnel could tie up all participating carriers' operations.

From the standpoint of congestion alleviation, the establishment of consolidated pickup and delivery operations should be encouraged as much as possible. However, in spite of the successful operation of the systems in St. Louis and in conjunction with the New York Union Motor Truck Terminal, it appears to the writer that the use of consolidated systems will be limited, at least for some time to come, because of the opposition of carriers as well as shippers and receivers. This is especially likely in the case of carriers who have extensive operations in a particular city and maintain large pickup and delivery fleets. It is also likely where speed is essential in the pickup and delivery of freight.

The major selling points of consolidated operations to the carriers and to some extent to shippers and receivers are their economy and convenience, and there are some cases where

these factors should outweigh the arguments in opposition. In smaller cities served by a number of carriers, it might be completely unfeasible for each carrier to provide its own pickup and delivery equipment due to the limited number of customers. Even in larger cities, it is often not economical for small carriers and carriers having only limited operations in the city to provide their own individual pickup and delivery service. These are the same type carriers that are most likely to utilize consolidated terminals. Consolidated operations are more likely to appeal to shippers and receivers who have a large number of shipments handled by a number of different carriers and where preference for the pickup and delivery service of a particular carrier is not a major factor. Consolidated operations are also more likely to be acceptable in cases where the participating carriers are noncompetitive.

In conjunction with consolidated pickups and deliveries, as well as with consolidated terminals, it is interesting to note that the same results are often achieved by actual consolidation of carriers. There is a continuing trend toward carrier consolidation among both small and large carriers. Regardless of the other effects of this trend, it is certainly favorable from the standpoint of congestion alleviation. Scheduled pickups and deliveries.-- Scheduled pickups and deliveries have been advocated as a measure to alleviate congestion and to promote more efficient truck operations. A

system of scheduled pickups and deliveries must be based upon an agreement between the truck operators and the shippers and receivers of merchandise, particularly in the case of pickups. Truck operators interviewed by the writer were unanimously opposed to a formalized and rigid system of scheduled pickups and deliveries. However, some of them admitted that they utilized an informal scheduled system based on cooperative agreements with some of their regular customers in their present operations.

The advantages of scheduled pickups and deliveries are:

1. Truck movements are spread out over a greater portion of the day with the result that not as many trucks are in the traffic stream at any one time. This is especially important in relieving rush hour congestion.

2. Fewer trucks call at a shipping or receiving dock or curb loading space at one time, which reduces loading and unloading congestion. This also spreads out the work of shipping and receiving personnel and encourages faster and more efficient operations.

3. Truck operators benefit through the spreading of their operations over a longer period, which results in better utilization of personnel and equipment.

The disadvantages, particularly of the rigidly scheduled system, are as follows:

1. There are numerous chances of unexpected delays which would disrupt the schedule.

2. The time required at each pickup or delivery stop will vary from day to day, depending upon the freight to be handled.

3. The number of pickup and delivery stops required varies from day to day.

It is the opinion of the writer that a compulsory and rigid system of scheduled pickups and deliveries would be unrealistic and unworkable. However, the informal system worked out between individual truck operators and their customers should be given every encouragement. The trend appears to be toward a greater use of voluntary scheduling as all parties recognize its labor and equipment saving benefits as well as its congestion alleviation advantages. For the present, this appears to be the only feasible and workable system.

Night loading and unloading.-- Some authorities feel that even off-peak hours curb loading and unloading operations cause too much congestion and advocate night or after business hours pickups and deliveries. In some cases, it is recommended for only the larger trucks, truckload shipments, or heavy and bulky freight. In others, it is advocated for all pickup and delivery operations. Night operations are generally recommended for only the central business district rather than for the city as a whole. Some cities require certain truck operations such

as the delivery of coal and the pickup of garbage and refuse to be carried on only at night in the central business district. As early as 1924, Boston prohibited all curb loading and unloading operations as well as curb parking in its central business district during business hours.⁹⁴

The major advantages generally given for night loading and unloading operations are as follows:

1. Congestion is greatly reduced by keeping a large number of trucks completely off the streets during the heavy business hours traffic movements.

2. Truck operators benefit through faster and more efficient operations because they have the streets virtually all to themselves at night.

There is a great amount of opposition to night operations whenever they are proposed. The major opponents are the firms requiring pickup and delivery service as well as a large proportion of the carriers. Night operations were required in the New York City garment district in 1948 and again in 1950, but both times they were defeated by the opposition of merchants and truckers.⁹⁵ The disadvantages of night loading and unloading operations, as set forth by these groups, are as follows:

⁹⁴Olmsted, op. cit., p. 12.

⁹⁵Arm, op. cit., p. 10.

1. The increased costs of keeping shipping and receiving departments open at night are too great because of overtime pay requirements, union resistance, the extra employees required, and disruption of normal operating procedures.

2. Small establishments cannot afford a night receiving clerk.

3. Many businesses are dependent upon frequent daytime deliveries for their normal operations.

4. Carriers cannot achieve the close supervision of their personnel required for efficient night operations. This was pointed out to the writer by Robert K. Morrow of Dixie Highway Express, Incorporated.

5. The pilferage problem is more serious with night operations.

Truck operators interviewed by the writer were fairly evenly divided between those favoring night operations and those opposed to them. All of the officials of public agencies interviewed felt that some form of night loading and unloading operations will eventually be required in the central business district of Atlanta. The opinion that businessmen and truck operators will have to accept more and more night loading and unloading as time goes by and traffic volumes increase is shared by many authorities.

There is no question of the great value of night loading

and unloading as a congestion alleviation measure. While some of its disadvantages are serious, they still do not outweigh its overall advantages where traffic conditions are such that its use is justified. Many of its disadvantages can be eliminated or reduced through adequate studies and development of new operational methods on the part of shipping and receiving departments as well as truck operators. It is the opinion of the writer that truck operators on the whole will cooperate and adjust their operations accordingly where night loading and unloading is adopted. The major problem will be to convince shippers and receivers that it is necessary. In view of its recognized hardships on the small merchant who depends upon a number of small shipments daily, it appears that a modified system could be devised whereby shipments under a designated size might continue to be delivered during business hours while the larger shipments could be handled after business hours. It is felt that such a modified system would alleviate most of the hardships that would result from a too rigid system of compulsory night operations and at the same time accomplish almost as much from the standpoint of congestion alleviation.

Better utilization of alleys.-- Where they are available, alleys should be utilized for truck loading and unloading operations. This reduces the number of trucks that must make pickups and deliveries at the curb. Every effort should be made to utilize alley space before setting up curb loading

zones. A Chicago ordinance prohibits curb loading and unloading at establishments which have alley loading space available.

Unfortunately, the use of alleys by trucks is often very limited. Some cities have very few alleys in their most congested areas. Many alleys are dead-end or narrow so that medium size trucks have difficulty getting in and out of them. One truck in an alley often effectively blocks it to other trucks. Many alleys are blocked by being used as parking or storage places for trucks or passenger cars. Lieutenant Fred Beerman of the Traffic Division of the Atlanta Police Department pointed out to the writer that many of the alleys in Atlanta are privately owned. For that reason, the Police Department is unable to control their use and to prohibit parking in them.

Although all alleys are not adequate for truck use, they should be utilized where possible. Some of the ways suggested for better utilization of alleys for truck operations include:

1. Establish one-way alleys.
2. Prohibit parking in alleys.
3. Set time limits on alley loading and unloading.
4. Open up dead-end alleys where possible.
5. Enlarge street curb cuts at alleys to make it easier for trucks to turn in and out.
6. Require that public alleys of adequate width for truck use be provided in all new commercial developments.

7. Where adequate alleys are available, the off-street loading and unloading provisions of the zoning ordinance should require loading bays to front on the alley rather than on the street. Many early zoning ordinances required loading bays fronting on alleys in all new commercial developments.

Truck parking lots.-- The provision of truck parking lots has been recommended in cities where trucks are frequently parked or stored on the street. Chicago had a serious problem with trucks operated by small carriers or carriers not maintaining adequate terminal facilities in the city which were parked on the street for considerable periods of time. Chicago's solution was the establishment of a truck parking lot on city owned land and the leasing of the lot to a private operator. The lot, which contains enough space for 450 vehicles, is operated on a 24 hour basis. The city receives 15 cents out of the 50 cents daily charge for each truck. The parking lot provides a number of special services including the sale of accessories and supplies, a free return-load bureau, transportation to hotels for drivers, and a non-profit credit service for out-of-town carriers.⁹⁶

The primary advantages of truck parking lots include:

1. Interference with moving traffic is reduced by storing trucks off the street.

⁹⁶American Society of Planning Officials, op. cit. p. 16.

2. Space at the curb is left open for parking of automobiles or curb loading and unloading operations.

3. The accident hazard created by large trucks parked on the street is reduced.

4. Theft of merchandise and truck parts and equipment is reduced.

5. Trucks do not have to cruise around looking for parking space on the street.

It is the opinion of the writer that truck parking lots are a very valuable alleviation measure in any city where a truck parking and storage problem exists. Even in cities that do not have this problem, privately or publicly operated truck parking lots might be justified from the standpoint of service and convenience to motor carriers and other truck operators.

Prohibition of angle parking by trucks.-- A frequently recommended congestion alleviation measure is the prohibition of angle parking or backing to the curb by trucks for loading and unloading purposes, either at all times or during designated hours. Since a truck backed to the curb has a far greater congesting effect than a truck parked parallel to the curb, this measure is utilized in a large number of cities, especially the larger ones.

The Improvement Plan For Trucking Operations, prepared for Charlotte, North Carolina, contains the following provision in regard to angle parking by trucks:

Under no conditions, however, should a truck be allowed to back in ninety degrees to the curb to load and unload, no part of the vehicle should extend past the parking lane, if parking is permitted. If parking is prohibited, then no truck should be allowed to extend past the curb or the lateral edge of the roadway during the period of time that such parking is not permitted. It is recommended that loading and unloading on the street be done with the VEHICLE PARKED PARALLEL TO THE CURB.⁹⁷

The major advantages of this measure are:

1. Trucks are prohibited from blocking the sidewalk and several lanes of the street needed for moving traffic.
2. The maneuvering of trucks backing into the curb is eliminated. A truck has a greater congesting effect while maneuvering into position than it has parked.

This measure should be instituted in some form in every city where trucks backing to the curb are a problem. It is recognized that the loading and unloading dock facilities of some establishments make it necessary for trucks to park at an angle in the street. As a result, it is up to the individual city to determine how far it wishes to go in limiting this type of operation. It is the opinion of the writer that the measure should be as stringent as possible since no establishment should be allowed to utilize excessive street space in this manner.

Overall evaluation of the alleviation measures and programs presently utilized.-- The measures discussed in this chapter

⁹⁷City of Charlotte, North Carolina, op. cit., p. 14.

represent a comparatively highly developed set of "tools" available for use in alleviating congestion resulting from truck operations. Their effectiveness in any situation depends upon the seriousness of the conditions and the skill with which they are applied. Although some measures are more effective than others in that they may apply to several aspects of the problem, the situation in most cases is so complex that any overall alleviation program requires the utilization of a number of measures.

The measures utilized in a particular urban area generally depend upon the extent of its congestion problem. Each city decides which of the available measures are best suited to its needs from the standpoints of effectiveness and acceptability. Unfortunately, many cities tend to make a very incomplete and superficial evaluation of their congestion problem and to select alleviation measures on the basis of such factors as the vogue at the time, the speed and ease with which they may be placed in operation, and the amount of opposition expected. Measures adopted in such a haphazard and unplanned manner generally result in unorganized and unwieldy alleviation programs.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS FOR A COMPREHENSIVE PROGRAM FOR THE ALLEVIATION OF CONGESTION RESULTING FROM MOTOR TRUCK OPERATIONS

A comprehensive program for solving the truck traffic congestion problem should include measures both for the alleviation of existing congested conditions and for preventing new difficulties from arising. In this way, existing congestion can be reduced and future problems can be eliminated. A program consisting primarily of palliative measures is a very costly and inefficient way of attacking the problem. In addition, conditions often grow more serious faster than they can be alleviated under such a system. This is one of the major defects of the programs employed in many cities.

From an overall viewpoint, the major shortcomings of most programs designed to alleviate congestion resulting from trucking operations are as follows:

1. The emphasis is placed primarily upon alleviating existing conditions rather than upon preventing future congestion through adequate planning.

2. There is often no single agency charged with the overall responsibility for establishing and carrying out a comprehensive congestion alleviation program.

Establishment of an adequate city planning program.-- The establishment of an adequate program of city planning is an

essential step in setting up a comprehensive program for attacking the truck traffic problem. This is a positive approach for the prevention of future congestion. An effective traffic program must be based upon the comprehensive plan for the city's future development. The parts of an overall city planning program which are of extreme importance from the standpoint of alleviating congestion resulting from truck operations are as follows:

1. A future land-use plan is essential to insure that all land-uses will be located in the area or areas of the city best suited for them from all standpoints including the transportation facilities required and the relationships to other areas of the city. Required traffic movements are reduced to a minimum by the selection of the best locations for the various parts of the city. In addition, an adequate future land-use plan makes it possible to determine in advance the relative amounts of truck traffic that will be generated in each area and thus to determine the necessary street facilities to be provided in each part of the city.

2. A major street plan is essential to show the locations and types of all existing and planned street facilities. The major street plan in conjunction with the future land-use plan insures that each area of the city will be served with the appropriate street facilities. It also insures that major traffic arteries will be located so as to best serve the heavy

traffic generating areas and to avoid areas where heavy traffic volumes would have adverse effects. A truck route system should be included in the major street plan. Care should be taken that the streets selected or constructed as truck routes meet truck route standards. Serious consideration should be given the inclusion of a circumferential highway system as a part of the major street plan where conditions warrant.

3. A very important part of the future land-use plan from the standpoint of truck congestion alleviation is the selection of truck terminal districts as such or the determination of the land-use areas where terminals will be allowed. The extent of the future terminal facilities required should be based upon a study of the facilities required for the city's past and present commercial and industrial developments. From this study, the future needs for terminals can be determined on the basis of the anticipated commercial and industrial development in the city. It is important that the areas selected for terminal locations be of adequate size for the required structures, parking and maneuvering areas, and the necessary auxiliary uses. In addition, the areas selected must be reasonably close to a majority of the city's freight shippers and receivers, relatively level, reasonably priced, and have access to major traffic arteries.

4. Appropriate zoning measures are required to insure that all future land-uses will be in conformance with the com-

prehensive plan for the city's development. Zoning is essential to protect the areas set aside for each land-use and to guide development in each area so that the traffic volumes generated will not be in excess of the capacity of the street systems. Zoning prevents areas set aside for truck terminals from being taken up by nonessential and undesirable uses. It is also necessary to insure that all land-uses requiring truck loading and unloading operations provide the necessary off-street facilities.

Establishment of an adequate traffic engineering program.--

The establishment of an adequate traffic engineering program under a single agency is essential in order to formulate and administer a comprehensive and carefully planned system of congestion alleviating measures. In this way, each measure functions as a part of the overall program. The inefficiencies and confusion resulting from needless duplication of similar measures are eliminated. The traffic engineering agency should have the broad view of the overall traffic problem necessary to keep the congestion alleviation program adjusted to changing needs. The work of the traffic engineering agency should include the following:

1. It should work in close cooperation with the city planning agency in setting up the truck route system. It should also determine the necessary engineering standards required for truck routes such as gradients, pavement thickness and width,

curvature, sight distances, access requirements, and signal operations.

2. It should work in cooperation with the city planning agency in determining the requirements for truck terminals and terminal areas in regard to such factors as access to major traffic arteries and location of access and egress points.

3. It should also cooperate with the city planning agency in making the necessary studies to determine the extent of and standards for the off-street loading and unloading facilities required for various land-uses.

4. It should make an overall study and evaluation of the city's truck loading and unloading requirements in order to determine which of the available loading and unloading regulatory measures should be employed. These include such measures as regulation of curb loading zones, limitation of truck sizes in central areas, regulation of loading and unloading hours, night loading and unloading, regulation of angle parking, and regulation of alley utilization.

5. It should work with truck operators and freight shippers and receivers in an effort to encourage these groups to employ operational methods that result in the smallest amount of congestion possible. These include the establishment of consolidated pickup and delivery service, informal scheduled pickups and deliveries, and consolidated truck terminals where conditions warrant. The necessity for the compulsory regulatory measures should also be explained to these groups and their co-

operation solicited in helping to make them successful.

It is important that the traffic engineering agency cooperate with the city planning agency to the greatest extent possible, particularly in regard to providing for future truck traffic movements, terminal facilities, and off-street loading and unloading facilities. A joint attack by the city planning agency and the traffic engineering agency working in close cooperation appears to be the best method for achieving an effective truck traffic congestion alleviation program.

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